

ADM 6.9/1978/ VOL. 2
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ADP MASTER PLAN

Volume II

January, 1978

GENERAL FINANCIAL MANAGEMENT TASK FORCE STUDY

Richard D. Lamm, Governor

Thomas H. Sheehan, Jr., Executive Director

Department of Administration



DEPARTMENT OF ADMINISTRATION

724 State Services Building
Denver, Colorado 80203

November 23, 1977

RICHARD D. LAMM
Governor

THOMAS H. SHEEHAN, JR.
Executive Director

Dear Governor Lamm:

Attached is a report summarizing a study of the ADP (Automated Data Processing) operations in the Departments of Administration, Revenue, and Social Services.

The Executive Directors of these departments formed an ADP Steering Committee earlier this past summer. Copies of transmittal letters from the other two Executive Directors are also attached. The ADP Steering Committee established a technical Task Force to investigate the feasibility of sharing ADP resources among the departments. The attached report is a good one. An important conclusion is that the combined workload of the three departments will exceed the ADP capacity sometime in the fall of 1978. In addition, each department will have to upgrade its individual computer capability in order to meet each department's projected workload. However, the Task Force recognizes that consolidation of ADP hardware is possible which would offer economies of scale and satisfy the aggregate projected workload. Three alternatives are discussed. They are:

<u>Alternative</u>	<u>Description</u>	<u>Estimated Savings (in millions)</u>
One	Continue to operate the three existing computer facilities	\$0.0
Two	Consolidate into two computer facilities	2.7
Three	Consolidate into one computer facility	4.3

The following are my comments on the five recommendations of the Task Force:

- Recommendation 1 supports the consolidation of ADP resources into two computer facilities. I agree that this recommendation is an initial consolidation step; however, after the three separate



computer centers, which now exist, have been consolidated into two, further consolidation into a single center may be appropriate. The single center may have more than one computer operating simultaneously.

- Recommendation 2 requires that the Executive Directors resolve the governance and funding of the consolidated computer center and equipment. I believe this issue can be resolved by establishing an Advisory Board composed of Executive Directors of the three departments. This Advisory Board would monitor the operation of the consolidated computer facility, which would report to the Division of ADP. In order to provide maximum flexibility, I believe that any new equipment should be leased during an initial period of consolidation, for example, the first year or two. Subsequent to the consolidation, the State should issue a request for proposal (RFP) for a purchase system.
- Recommendation 3 revolves around confidentiality and privacy of data. Because the State collects and uses confidential data, I do not believe that integrity of data is a significant concern. If reasonable safeguards are installed, a single computer center is easier to control and secure than three independent facilities because greater fixed investments in security devices can be made.
- Recommendation 4 requires that current computer programs be executed on whatever system is installed. In order to satisfy this technical concern, I recommend that vendors be asked through RFI (request for information), whether or not they would be interested in responding to the State's needs within the time frame. This approach would not exclude a potential vendor, but recognize the large expense associated with responding to an RFP. An attempt should be made to minimize this expenditure for half a dozen different vendors, some of whom could not successfully meet the constraints.
- I agree that whichever alternative is chosen; this process should begin immediately.

The Task Force mentions two risks associated with Alternative Three. The first risk is associated with obtaining 4600 additional square feet for storage in a consolidated configuration. I understand that this space could be available at the Division of ADP if existing operations were moved. The second risk suggests that security problems are greater with a single center than with two or three different locations. I disagree; a single location permits larger investments in security. If normal catastrophe preventative procedures are employed, then no undue risk need be associated with a single center than with several remote sites.

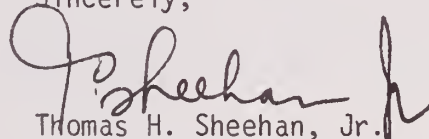
Governor Richard D. Lamm
November 23, 1977
Page Three

The Task Force states that an additional 250 to 500 man months of application computer programming are needed to accomplish Alternative Two. This effort would convert existing application programs. I disagree with the order of magnitude of this investment. One or two man years may be required, but certainly not the 40 man years that are suggested by the Task Force.

What would happen if this proposal to consolidate the ADP resources of the Departments of Administration, Revenue, and Social Services does not occur? First, the combined expenditures for the three separate centers would be higher than if consolidation occurred. Second, I do not believe that the Legislature will fund the three separate centers to the level required in order to maintain existing, let alone desired, service levels. Third, a general degradation of computer service will result. Fourth, the State will miss an excellent opportunity to encourage economy while improving productivity of State government.

Because of these reasons, I urge you to support the consolidation of ADP in the Department of Administration, Revenue, and Social Services and ask you to endorse this plan.

Sincerely,


Thomas H. Sheehan, Jr.
Executive Director

THS/1

Governor Richard D. Lamm
State of Colorado
State Capitol Building
Denver, Colorado 80203

Attachment



State of Colorado

DEPARTMENT OF REVENUE

STATE CAPITOL ANNEX

1375 SHERMAN STREET

DENVER, COLORADO 80261

Telephone (303) 839-3091

Richard D. Lamm
GOVERNOR

Alan N. Charnes
EXECUTIVE DIRECTOR

November 18, 1977

TO: The Honorable Richard D. Lamm

FROM: Alan N. Charnes *Alan*

SUBJECT: Report and Recommendations for the Automated Data Processing (ADP) General and Financial Management Computer Center

I hereby submit this letter for the Department of Revenue in support of the recommendations made by the Task Force. The Task Force recommended Alternative II of the State ADP Master Plan of March '77, which is the consolidation of three computer centers into two computer facilities. Specifically, a General Computer facility and a Financial Computer facility.

However, the report used the three departments total budget requests for 1978-79 before any reductions by EBO or JBC. The Task Force report should be reevaluated after the Long Bill comes out next year to see how much of the ADP Master Plan and Task Force recommendation can be funded and implemented.



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RICHARD D. LAMM
GOVERNOR

State of Colorado

DEPARTMENT OF SOCIAL SERVICES

1575 SHERMAN STREET
DENVER, COLORADO 80203

HENRY A. FOLEY, Ph.D.
Executive Director

November 21, 1977

Mr. Thomas Sheehan
Executive Director
Department of Administration
State Services Building
1525 Sherman Street
Denver, Colorado 80203

NOV 21 1977

Dear Mr. Sheehan:

The Department of Social Services is in general agreement with the analytical work done by the ADP Task Force. The Task Force did an extremely credible job on a difficult assignment in a very short time-frame. Until such time, however, an Executive Director is appointed for the Department, we must reserve our comments on the recommendations stated in the Task Force report.

Sincerely,

GARY A. SMITH
Assistant Director for Program
Evaluation, Planning & Budget

GAS:ljw

STUDY FOR THE ADP
GENERAL AND FINANCIAL
MANAGEMENT
STEERING COMMITTEE

OCTOBER 1977

1978

The seal of the State of Colorado is a circular emblem. It features a central five-pointed star. The words "STATE OF" are written in a semi-circle along the top inner edge, and "COLORADO" is written in a semi-circle along the bottom inner edge.

ADP MASTER PLAN



DEPARTMENT OF ADMINISTRATION

724 State Services Building
Denver, Colorado 80203

RICHARD D. LAMM
Governor

THOMAS H. SHEEHAN, JR.
Executive Director

MEMORANDUM

TO: ALAN CHARNES, EXECUTIVE DIRECTOR,
DEPARTMENT OF REVENUE

HENRY FOLEY, EXECUTIVE DIRECTOR
DEPARTMENT OF SOCIAL SERVICES

THOMAS H. SHEEHAN, JR., EXECUTIVE DIRECTOR
DEPARTMENT OF ADMINISTRATION

FROM: THE ADP GENERAL AND FINANCIAL MANAGEMENT TASK FORCE

SUBJECT: FINAL REPORT AND RECOMMENDATIONS FOR THE AUTOMATED
DATA PROCESSING (ADP) GENERAL AND FINANCIAL MANAGEMENT
COMPUTER CENTER

The mission of the Task Force was to recommend the most cost effective and manageable alternative that would meet the application needs and service level requirements of the Department of Revenue, Department of Social Services, and Division of Automated Data Processing and their users during the next five years.

Attached is the final report of the evaluation of the following three alternatives for the General and Financial Management Computer Facilities:

1. continue to operate three existing computer facilities,
2. consolidate into two computer facilities, or
3. consolidate into one facility.

Each of the above alternatives could satisfy the anticipated application workload. Planned capacity needs include an additional ten percent for unanticipated work and service level requirements requested during the next five years. Using Alternative One as a base, Alternative Two has a potential savings of 2.7 million dollars. Alternative Three has a potential savings of 4.3 million dollars. This potential savings results from the elimination of redundant operational positions throughout the conversion period, using attrition.

The economies of scale offered by Alternative Three include two items of risk, which were not included in the costs. First, facilities to support the computer and its associated forms and supplies require 4600 square feet of additional space. Second, the management

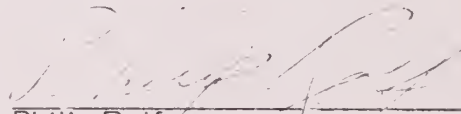


and security problems which could exist with a facility of this size could reduce the potential dollar saving. Therefore, the Task Force recommends Alternative Two as the most manageable, realistic long-range solution for the State.

We are grateful for the cooperation of those personnel in the Department of Revenue, Department of Social Services and Division of ADP who provided the Task Force with information and advice.



Robert Greene
Chief of Office of Information Systems
Department of Social Services



Philip Rolf
Systems Analyst Manager
Department of Revenue



Ronald Parker (Chairman)
Principal Systems Analyst
Division of ADP

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This report is an output recommended by the State of Colorado 1977 ADP (Automated Data Processing) Master Plan, which was approved by the Executive Director, Department of Administration, Thomas H. Sheehan, Jr., and endorsed by Governor Richard D. Lamm. The 1977 ADP Master Plan identified that a possibility of consolidation of ADP resources existed among several departments, and recommended that a Steering Committee of Executive Directors and a working Task Force be established to study the possibility.

This study was prepared by the Task Force with member representation from the Department of Revenue, Department of Social Services, and Division of ADP within the Department of Administration. The Executive Directors of these departments are the General and Financial Management (GFM) Steering Committee that was established to provide direction and guidance.

The Task Force purpose is to determine the most cost effective and manageable alternative for meeting the ADP applications and service level requirements of the Department of Revenue, Department of Social Services, and Division of ADP and their users during the next five years. In addition, this report provides assistance in operational planning and budget preparation. The Task Force examined departmental ADP requirements using three alternative approaches:

- Alternative One continue to operate three computer centers,
- Alternative Two consolidate into two computer facilities, or
- Alternative Three consolidate into one facility.

The Task Force did consider governance, funding, confidentiality and privacy of personnel information contained in computerized data files and made recommendations.

The following chart depicts the estimated total number of central processing unit (CPU) hours that will be required by the three existing computer centers for each of the fiscal years shown.

APPLICATION WORKLOAD REQUIREMENTS BY FISCAL YEAR

Based on a standard IBM System 370 Model 145 CPU Hour

ORGANIZATIONAL UNIT	77 - 78 CPU HOURS	78 - 79 CPU HOURS	79 - 80 CPU HOURS	80 - 81 CPU HOURS	81 - 82 CPU HOURS	82 - 83 CPU HOURS
AVAILABLE	16,176	16,176	16,176	16,176	16,176	16,176
REQUIRED						
Division of ADP	6,362	7,665	9,083	10,184	10,754	11,584
Department of Revenue	5,065	6,150	6,624	7,105	7,650	8,111
Department of Social Services						
Basic	3,239	3,799	2,686	3,042	3,175	3,331
Basic + MMIS & MRE*	3,239	6,664	8,011	10,042	10,168	10,571
TOTAL 1	14,666	17,614	18,393	20,331	21,579	23,026
TOTAL 2	14,666	20,479	23,718	27,331	28,572	30,266
DIFFERENCE 1	1,510	(1,438)	(2,217)	(4,155)	(5,403)	(6,850)
DIFFERENCE 2	1,510	(4,303)	(7,542)	(11,155)	(12,396)	(14,090)

* The Department of Social Services workloads were projected both with and without two new major applications: Monthly Reporting Experiment (MRE) for welfare clients and Medicaid Management Information System (MMIS). If either one, or both, do not materialize the class of computer to implement the projected workload may change.

The Task Force estimated the future ADP requirements using a standard CPU hour and computer program mix similar to the existing computer equipment, IBM System 370 model 145, and application computer programs. The difference between available and required computer capacity is shown for two totals. Total 1 includes the basic workload in the Department of Social Services; Total 2 includes two new major applications for the Department of Social Services. As indicated these three departments will experience a shortfall in computer capacity beginning in the fall of 1978.

In order to solve the projected shortfall problem, the Task Force classified various computers' configurations based upon their relative power. This technique allowed the Task Force to determine the size of computer equipment needed to meet the data processing workload requirement of the three existing computer centers and their users. The Task Force used the application requirements of each department starting with Fiscal Year 1977-78 as the base. These applications were analyzed and subdivided into projected requirements for personnel, equipment, and software for the three alternatives.

Service levels including response times were applied to each of the three alternatives approached to determine the class of computers and the relative computer power need to satisfy a computer hardware upgrade, which had to hold for a minimum of three years. The cost estimates for hardware includes sufficient capacity to process the projected user workload plus an increase of 10% for un-anticipated workloads. Personnel, operating cost, vendor software, computer equipment, i.e., magnetic tapes, disk, printers, and data communication were estimated to determine if any category should be eliminated, expanded, or remain the same.

Alternative One was used as the base because it corresponds closely to the existing situation in the three departments. Additional cost adjustment to Alternative Two and Alternative Three were made to allow for the projected economies of scale from consolidation. Facility costs for site preparation, air conditioning, emergency backup power generator supply, and security items were included as one-time costs in FY 1978-79.

The following chart depicts projected costs for each alternative by fiscal year through the planning period.

1978
STATE OF
COLORADO

ADP MASTER PLAN

COMPARISONS

Total Cost

(cost in thousands of dollars)

Fiscal Years	Alternative One	Alternative Two	Alternative Three
1978 - 79	\$ 11,089	\$ 10,838	\$ 10,941
1979 - 80	10,468	9,780	9,492
1980 - 81	10,885	10,179	9,715
1981 - 82	11,229	10,857	10,385
1982 - 83	<u>11,622</u>	<u>10,920</u>	<u>10,433</u>
TOTAL COST	\$ 55,294	\$ 52,576	\$ 50,966

Present Value of Total Cost

(cost in thousands of dollars using a 15% discount rate)

\$ 42,333\$ 39,555\$ 38,237Present Value of Total Incremental Investment

(cost in thousands of dollars using a 15% discount rate)

\$ 7,312\$ 4,526\$ 3,215

Number of
operational positions
FTE

1097260

The economies of scale offered by Alternative Three entails two items of risk. First, facilities to support the computer and its associated forms and supplies must be examined and assessed to determine the feasibility of additional space requirements. The results of this examination could reduce the potential savings realized. Second, the management and security problems which may exist with a facility of this size could reduce the dollar savings.

Recommendation 1

The majority of the Task Force recommends Alternative Two. The Task Force believes it is the most manageable, realistic long-range approach to provide ADP capability to the Departments of Administration, Revenue, and Social Services and their users.

Recommendation 2

Executive Directors should resolve the governance and funding of the computer facility.

Recommendation 3

The Executive Directors should resolve the issue of confidentiality and privacy of personnel information contained in computerized data files.

Recommendation 4

The selected central processors should have the capability of executing the current computer programs without changes, in order to realize the projected savings.

Recommendation 5

All three Alternatives require the acquisition of new computer equipment. This acquisition process should start immediately.

Although the majority of the Task Force recommended Alternative Two, one member feels the recommendation for Alternative Two is questionable. The economic analysis disregarded the opportunity cost of 250 to 500 man months estimated to accomplish Alternative Two during the next eighteen months. This level of effort would require key skills of individuals currently within the three organizations. This would preempt these resources from designing, developing, programming and implementing planned systems for the ultimate users. This delay or postponement of current activities could significantly reduce the potential savings (opportunity cost).

INTRODUCTION

The 1977 ADP Master Plan was supported and endorsed by the Executive Director of the Department of Administration, Thomas H. Sheehan, Jr., and approved by Governor Richard D. Lamm. Their endorsement provides for an evolutionary upgrading of ADP applications and resources in Colorado.,

The 1977 ADP Master Plan outlined three distinct alternatives for developing ADP:

- Alternative One - Continuation of the existing 21 computer centers with some consolidation possible after a series of Task Force studies - Managed Growth Approach.
- Alternative Two - Expansion to 29 computer centers by decentralizing ADP capabilities - Uncontrolled Growth Approach.
- Alternative Three - Consolidation to ten computer centers by centralizing ADP - Centralized Control Approach.

Although Alternative Three offered greater economy, Alternative One was followed during the current fiscal year for several reasons including limited financial support, and a need for additional planning for consolidation. Alternative One included the continuation of activities for statewide ADP planning and coordination and the creation of several inter-departmental Task Forces to study and oversee, where appropriate, potential consolidation of ADP resources. This study was prepared by a Task Force, with representation from the Departments of Revenue, Social Services and the Division of ADP. The Task Force studied consolidation of their respective computer facilities to see if it is technically, economically and administratively feasible. The Executive Directors of these departments are members of the General and Financial Management (GFM) Steering Committee that was established to provide direction and guidance to the Task Force. See Exhibit A.

STUDY PURPOSE AND SCOPE

The purpose of the Task Force was to determine the most cost effective and manageable alternative for meeting the application and service level requirements of the ADP Users of the three computer centers located in the Departments of Revenue, Social Services, and Division of ADP over the next five years:

The following objectives should be met in order to satisfy this purpose:

- I. To provide, by application, the workload requirements for the next five years. See Exhibit B.

2. To provide planning and budget guidance for the departments of Social Services, Revenue and Administration. See Exhibit C.
3. To establish acceptable service levels for each type of service to be provided by the computer facilities. See Exhibit D.

The Task Force examined the Automated Data Processing (ADP) requirements of the departments and agencies currently being served by the Department of Revenue, Department of Social Services, and the Division of ADP Computer Centers. The Task Force developed the associated costs of three alternatives based upon a five-year projected plan. The three alternatives are:

1. continue to operate three Computer Centers,
2. consolidate into two computer facilities, or
3. consolidate into one facility.

This examination used the computer application requirements of each department starting with fiscal year 1977-78 as the base and projected computer application growth for personnel, equipment and software through FY 1982-83.

Service level standards were established for each type of service to be provided by the Computer Centers to their User Communities. These service levels were applied to the projections to determine the relative computer power. From technical literature and consultation with the present vendor, the Task Force classified various computers based upon their relative computer power. The application requirements were then compared with the various classes of relative computer power to determine the size of computer necessary to meet the extrapolated data processing needs assuming no change in user community at each of the three existing centers. The best central processor configuration for the three centers to continue their operation under Alternative One was used as a base.

In developing the costs and computer requirements for Alternative Two, user applications were realigned by function, or program (not computer program). For example: accounting, personnel, budgeting, revenue collection, etc. were put on a Financial Management Center and the rest of the applications were put on a General Government Center. Again the projected workloads of the two centers were applied against the various computer class-sizes to determine the best central processor configurations for both centers.

Alternative Three was developed by taking the entire workload and, as in the other alternatives, applying it against the various computer class-sizes. Although one large processor could handle the entire workload, two were selected in order to have backup capability at all times.

Once the hardware requirements were determined for each alternative, the personnel needs were developed for each. See Exhibit E.

In order to compare all three alternatives, additional factors had to be considered. Site preparation costs, including air conditioning and power, differ in each alternative. See Exhibit F. The salvage value of paid-off equipment had to be considered as well as changes in software requirements and program migration. See Exhibit C.

ASSUMPTIONS

In performing the required analysis, the following assumptions were used:

1. Current year (FY 1977-78) costs provides equality as a base line for the comparative cost analysis of the three alternatives.
2. The planned application workload projections and performance standards prepared by each of the three existing centers provide comparable future costs to the evaluation of alternatives when using a single vendor's hardware and software cost estimates.
3. Sufficient hardware capacity to handle a 10% non-anticipated workload is included in this study.
4. A new hardware configuration must satisfy workload requirements for a minimum of three years.
5. Governance and accountability are issues that will be resolved by the Executive Directors,
6. Confidentially and privacy of personnel information contained in computerized data files will be resolved by the Executive Directors.
7. The cost to make all computer programs compatible should be calculated and included in this study.
8. The current practice of locating data entry, systems, and programming personnel with the end user will be continued.

9. A detailed implementation plan for the selected alternative, based on budgetary considerations, will follow this report.
10. Social Services operational cost estimates include \$650,000 for fiscal agent (Blue Cross and Blue Shield) for fiscal year 1978-79.
11. The three alternatives provided will be the only alternatives explored.

INTRODUCTION

This section explores the three alternatives defined in the General and Financial Management Steering Committee's letter and in the "Study Purpose and Scope" section of Chapter II, of this report. See Exhibit A.

WORKLOAD AND REQUIRED RESOURCES

The Task Force projected resource requirements by using the applications and service levels requested by the users of the three computer centers. Each application was examined with respect to both its external influences and its internal requirements. The external influences were the needs of the user such as the frequency of process, type of output, and turn-around time. Internal requirements include the number and languages of programs, types and sizes of storage devices, mode and time of process, and software. See Exhibit B. Agreement was reached among the departments that operate the current computer centers about a set of performance standards that will meet the needs of all users. See Exhibit D. The Task Force then established criteria for measuring relative computer power for projecting workload capacities and providing a base for costing each alternative. See Exhibit G.

The alternatives described in detail in the remainder of this section are based upon the user application workloads, related service standards, cost comparisons and economic analysis.

ALTERNATIVE ONE

This alternative is the continued operation of the existing three computer facilities with periodic capacity upgrades to accommodate workload and application increases. See Exhibit G. The following analysis allows comparisons with the other two alternatives so that an economic analysis could be conducted.

Method of Estimating Requirements

The FY 1977-78 estimated expenditures cost is considered to be the base required to maintain the same equipment, software, facilities and personnel that are currently in use. The application workload and service level standards are projected into hardware, software and personnel requirements through FY 1982-83.

The Task Force provided sufficient capacity to process the projected user workload plus an increase of 10% for non-anticipated workload. Site preparation costs were needed and included for the Social Services' facility.

Projected Improvements

The major improvements contained in Alternative One cost projections are summarized as follows:

- Install three (3) Class II Central Processors, one Central Processor for each of the three existing Computer Centers.
- Disk storage capacity to be increased.
- Terminals to be added.
- Release one of the Division of ADP's Central Processors currently being leased.
- Relocate one of the Department of Revenue's paid-off Central Processors displacing a leased Central Processor at another State agency.

Cost

Alternative One would cost approximately \$990,000 per year for new central processing units through FY 1982-83 and would utilize 109 personnel to operate the centers over the planning period. See Exhibit E. Table I of Exhibit C summarizes the costs by fiscal year through the planning period.

ALTERNATIVE TWO

This alternative is to consolidate into two computer facilities, namely, the General Government and the Financial Management Centers.

Method of Estimating Requirements

The base used for estimating cost is the same as that used in Alternative One. The application workload and service level standards are projected into estimating hardware, software and personnel that would be required by the two computer facilities.

Site preparation costs were included for this alternative for the computer facilities. Associated costs were not added for forms storage and relocation of other personnel occupying the required space. See Exhibit F.

Projected Improvements

The major improvements contained in Alternative Two cost projections are summarized as follows:

- Install one Class II and one Class III Central Processor in the Financial Management and General Governance Center, respectively.
- Disk storage capacity to be increased.
- Terminals to be added.
- Release one of the Division of ADP's Central Processors currently being leased.
- Relocate three paid-off Central Processors from the Department of Revenue, Department of Social Services and Division of ADP displacing leased and requested equipment to other State agencies.

Cost

Alternative Two would cost approximately \$946,000 per year for new central processing units through FY 1982-83 and employ approximately 72 personnel to operate the computer facilities during the planning period. Table 2 of Exhibit C summarizes the costs by fiscal year through the planning period.

ALTERNATIVE THREE

This alternative is to consolidate into one computer facility.

Method of Estimating Requirements

Costs and equipment for FY 1977-78 are considered to be equal for all alternatives as any change would not occur prior to FY 1978-79. The application workload and service level standards are projected into hardware, software, and personnel requirements during the planning period.

The physical site preparation costs were included for this alternative for the computer facilities. Associated costs were not added for forms storage and relocation of other personnel occupying the required space. See Exhibit F.

Projected Improvements

The major improvements contained in Alternative Three cost projections are summarized as follows:

- Install one Class II and one Class III Central Processor.

- Disk storage capacity to be increased.
- Terminals to be added.
- Release one of the Division of ADP's Central Processors currently being leased.
- Relocate four paid-off Central Processors from the Department of Revenue, Department of Social Services and the Division of ADP displacing leased and requested equipment in other State agencies.

Cost

Alternative Three would cost approximately \$946,000 per year for new central processing units through FY 1982-83 and employ approximately 60 personnel to operate the facility during the planning period. Table 3 of Exhibit C summarizes the costs by fiscal year through the planning period.

This alternative requires the highest one-time costs because it would require extensive facilities preparation.

DISCUSSION

The following pages provide a cost comparison and highlight the most significant advantages and disadvantages of the three alternatives.

Cost Comparison of Alternatives

Exhibit 3-1 shows the estimated costs for each alternative by fiscal year through the planning period in constant 1977 dollars.

EXHIBIT 3-1

COST COMPARISON ALTERNATIVE

(cost in thousands of dollars (000) for five years)

Fiscal Years	Alternative One	Alternative Two	Alternative Three
1978 - 79	\$ 11,089	\$ 10,838	\$ 10,941
1979 - 80	10,468	9,780	9,492
1980 - 81	10,885	10,179	9,715
1981 - 82	11,229	10,857	10,385
1982 - 83	<u>11,622</u>	<u>10,920</u>	<u>10,433</u>
TOTAL COST	\$ 55,294	\$ 52,576	\$ 50,966

Alternative Three is the least costly alternative from a total cost standpoint. The total investment includes ongoing expenditures for personnel, operating expense, travel, and capital outlay. The present value of this stream of investments using a 15% cost of capital is shown in Exhibit 3-2.

EXHIBIT 3-2
PRESENT VALUE OF TOTAL INVESTMENT
(using a 15% discount rate)

Year	Alternative 1	Alternative 2	Alternative 3
0	\$ 10,972	\$ 9,971	\$ 9,844
1	9,103	8,505	8,254
2	8,230	7,696	7,346
3	7,383	7,138	6,828
4	<u>6,645</u>	<u>6,245</u>	<u>5,965</u>
TOTAL	\$ 42,333	\$ 39,555	\$ 38,237

Exhibit 3-3 shows the present value of the incremental (new) investment in ADP resources through the planning period.

EXHIBIT 3-3
PRESENT VALUE OF INCREMENTAL (NEW) INVESTMENT
(using a 15% discount rate)

Year	Alternative 1	Alternative 2	Alternative 3
0	\$ 1,887	\$ 886	\$ 759
1	1,203	604	3546
2	1,361	821	476
3	1,410	1,165	855
4	<u>1,451</u>	<u>1,050</u>	<u>771</u>
TOTAL	\$ 7,312	\$ 4,526	\$ 3,215

Exhibit I, in the appendix, is provided to assist in determining the best financial arrangement for the selected alternative.

CONCLUSIONS

Alternative Three (one computer center) is the least costly alternative both from a total cost and a present worth standpoint. In addition, it offers the best rate of return. The cost difference between Alternative One (three computer existing facilities) and Alternative Three is 4.3 million dollars with the possible reduction of forty-nine (49) operational positions. These positions represent an approximate 3.2 million dollars savings in personnel cost during the period.

Alternative Two (two computer centers) is the second lowest costly alternative from a total dollar cost and a present worth standpoint. The cost difference between Alternative One (three existing computer facilities) and Alternative Two (two centers) is 2.7 million dollars with the possible reduction of thirty-seven (37) operational positions during the period. These positions represent an approximate 2.4 million dollars savings in personnel cost through FY 1982-83.

Alternative One (three existing centers) will have the highest total cost, but one-time costs for site preparation and program migration to the new equipment will be small. Each of the alternatives represents an increase in funding over the current years cost. In the past, legislative support of requests for ADP funds has tended toward only modest annual increases.

Economic considerations are not all internal ones. While evaluating the alternatives, one must associate the reasons for increasing costs and the computing industry's response. Colorado, like other governmental and business enterprises, is experiencing ever-increasing demands on the computer to store, manipulate, and access larger amounts of data. The computer industry has reacted by providing faster processors with better data storage capability. Today, with larger computers, the cost to process a transaction or to store a given amount of data is lower and that cost trend is still going down.

The number of transactions and the quantity of data are not the only needs of the users. For example, they need the use of new technology offered by the faster and larger computers to provide information in variable ways to meet a user's need-of-the-moment with the least effort on his part. Speed and access are also important. The user's access to the new technology means sophisticated computer software, various types of intelligent terminals, and improved communications facilities. Increased total costs may result even though substantially reduced unit costs appear likely.

Administrative changes also are brought about by the newer technology and the larger computers required to utilize it. The increased capability of new computer technology can support a larger community of users and provide data more easily to the entire community.

Significant administrative change may also occur in the area of personnel. Fewer computers will be needed as their individual capacities increase. As a result fewer people will be needed to operate a computer center. Data collection should become more automatic, thereby eliminating special groups of people to transform information. Technical personnel for sophisticated software and data communications may be needed in larger numbers.

Continuing the status quo, as suggested in Alternative One, does little to encourage the sharing of computerized data and does not provide the most economical means for establishing data communication networks for long-range statewide planning. For example, various Executive Branch Departments and the Legislature have indicated the need to access the same financial, budgetary, personnel, and program data.

Alternative Two (two centers) provides a manageable first step toward an economical long-range solution for the State in sharing data and taking advantage of data communication networks. All three existing computer facilities have the required space to expand with little or no effect on other personnel. Alternative Two provides a means to take advantage of the hardware economies of scale and other managerial benefits to combat the rising personnel, communications, and maintenance costs. In addition, this alternative provides a means to reduce statewide data processing expenditures by relocation of three paid-off Central Processors to displace leased and requested equipment.

Alternative Three (one center) provides the State the best economies of scale and benefits for minimizing the rising personnel, communications, and maintenance costs. In addition, this alternative provides the best means to reduce statewide data processing expenditures by relocation of four paid-off Central Processors to displace leased and requested equipment.

The economies of scale of Alternative Three should be balanced against two items of risk. First, physical facilities to support the one computer center create unique operational conditions not found in the other two alternatives. For example, computer backup capability for a facility of this size is non-existent in Colorado State government. The establishment of a fall-back position may create an unbearable time delay in critical situations, such as writing of State warrants; processing welfare recipients' eligibility and claims; processing drivers' licenses, motor vehicle and income tax. Second a security problem could exist with the storage of a large percent of the State's computerized data in one location. The present computer facilities are not constructed to withstand destructive acts.

The two and three computer center concepts are conducive to the creation of backup capability. The largest percent of the batch production work could be accomplished with very little delay for critical jobs.

The storage and distribution of forms in a one computer center creates unique space and control requirements. The existing three centers presently require 4600 square feet of storage for computerized forms. These forms are presently being stored for a maximum of one month to eliminate some of the space problems. The storage of these forms away from the computer room would create scheduling and production problems. The distribution of the massive computerized forms printed could create a control problem and additional cost providing the user community is not addressed when selecting a site for the computer facilities.

In summary, Alternative Two affords the State the least costly and most manageable, long-range solution. The Task Force feels the high risks associated with Alternative Three off-set the potential savings which could be realized.

Recommendation 1

THE MAJORITY OF THE TASK FORCE RECOMMENDS ALTERNATIVE TWO (TWO CENTERS) AS IT PROVIDES THE STATE THE MOST MANAGEABLE, REALISTIC, AND ECONOMICAL LONG-RANGE METHOD TO PROVIDE ADP SUPPORT TO ITS DEPARTMENTS AND THEIR USERS.

Although Alternative Three is the most economical alternative, the Task Force judged it to be less manageable than Alternative Two. The Task Force visualizes that the financial affairs of the State will continue to involve and occupy a greater amount of all State agencies' time and effort than any other single set of applications. The growth potential of the financial management function was also considered -- it is subject to a high degree of acceleration because needed systems are still under development. Examples are: the State Budget System, a Cost Accounting System, and the Department of Revenue's planned redesign of its Taxation and Enforcement System.

Within general government, on the other hand, an application often services a single agency. Consequently there are many such applications and they occupy a great amount of prime shift time. In order to reduce the amount of contention for prime time, two computers are considered more realistic than one. Also, by providing for compatibility between the computers, a back-up capability can be achieved.

Recommendation 2

EXECUTIVE DIRECTORS SHOULD RESOLVE THE GOVERNANCE AND FUNDING OF THE COMPUTER FACILITY.

The Task Force was not charged to address the subject of governance and funding. Because Alternatives Two and Three will promote changes to the present departmental responsibilities for computer operations and budgeting, however, the Task Force was confronted with it as a potential problem. It was generally concluded that necessary changes in responsibility among the departments could be resolved by the respective Executive Directors.

Recommendation 3

THE EXECUTIVE DIRECTORS SHOULD RESOLVE THE ISSUE OF CONFIDENTIALITY AND PRIVACY OF PERSONNEL INFORMATION CONTAINED IN COMPUTERIZED DATA FILE.

This recommendation, also, is made for the purpose of gaining the attention of the Executive Directors. The Task Force considers that, in any alternative, adequate computer resources have been provided to accomodate any of the currently available computer techniques for protection against unauthorized access and use of data.

Recommendation 4

THE SELECTED CENTRAL PROCESSORS SHOULD HAVE THE CAPABILITY OF EXECUTING THE CURRENT COMPUTER PROGRAMS WITHOUT CHANGES, IN ORDER TO REALIZE THE PROJECTED SAVINGS.

The Task Force has concluded that it is inadvisable to act upon a consolidation of these computing resources and a transition to an unfamiliar type of computer, simultaneously. Each of the existing computer centers and the users are operating with IBM System 370 and personnel are highly qualified in that environment. Also, no computer center or its customers had planned to move from that environment because of any systems deficiencies. Although there are some differences among the current centers in respect to the software being used, the IBM System 370 can accommodate those differences even if the centers are consolidated.

A decision about this matter had to be made early in the Task Force's deliberations -- before the economic analysis had begun. If a new kind of computer, (i.e., one offered by a vendor that was not compatible with existing programs, languages, or protocols) was to be considered, the cost estimates would need to include time and costs for extensive conversion and retraining of ADP and user personnel.

The Task Force wishes to point out that open consideration of all available processors may be advisable at a later date and after consolidation is accomplished to see if additional benefits can be anticipated.

Recommendation 5

ALL THREE ALTERNATIVES REQUIRE THE ACQUISITION OF NEW COMPUTER EQUIPMENT. THIS ACQUISITION PROCESS SHOULD START IMMEDIATELY.

With this recommendation, the Task Force emphasizes the timeliness for action and that, regardless of the alternative selected, there is immediate need for additional computing resources.

APPENDIX

EXHIBITS

The Appendix contains exhibits that are referenced in the preceding text.

EXHIBIT A - Task Force Appointing Letter from the Steering Committee

EXHIBIT B - User Application, Workload (samples)

Department of Social Services

- Application Characteristics - Illustration 1
- Application Recap - Illustration 2
- Workload Recap by Fiscal Year - Illustration 3

Department of Revenue

- Application Characteristics - Illustration 1
- Application Recap - Illustration 2

Workload Recap by Fiscal Year - Illustration 3

Division of ADP

- Application Characteristics - Illustration 1
- Application Recap - Illustration 2
- Workload Recap by Fiscal Year - Illustration 3

EXHIBIT C - Method of Projecting Costs

EXHIBIT D - Service Level Requirements

EXHIBIT E - Personnel Requirements

EXHIBIT F - Physical Site Considerations

EXHIBIT G - Computer Utilization and Costing

EXHIBIT H - Economic Analysis

EXHIBIT I - Financial Analysis

EXHIBIT A



RICHARD D. LAMM
Governor

THOMAS H. SHEEHAN, JR.
Executive Director

DEPARTMENT OF ADMINISTRATION

724 State Services Building
Denver, Colorado 80203

September 2, 1977

Mr. Robert Greene, Jr.
Manager of Information Systems
Department of Social Services
1575 Sherman Street
Denver, Colorado 80203

Dear Bob:

This letter is to advise you that you have been appointed by the General and Financial Management Steering Committee to serve on a task force.

The purpose of the task force is to examine the ADP requirements of the departments and agencies currently being served by the Department of Revenue, Department of Social Services and the Division of ADP Computer Centers, and develop the associated cost projections based upon three alternatives, namely, continued operation of the three facilities, operating only two facilities (as indicated in the State ADP Master Plan) and operating one facility to serve the community of users.

Mr. Ron Parker will serve as the chairman and coordinator of the task force activities which should start immediately. The effort should be completed by September 30, 1977 with the submission of the group's recommendations to the undersigned steering committee.

October
WAF

Sincerely,

Alan N. Charnes

Alan N. Charnes
Executive Director, Dept. of Revenue

Henry A. Faley

Henry A. Faley, Ph.D.
Executive Director, Dept. of Social Services

Thomas H. Sheehan, Jr.

Thomas H. Sheehan, Jr.
Executive Director, Dept. of Administration

ANC/HAF/THS/ld

NOTE: Same identical letter sent to Ron Parker, Department of Administration, and Phil Rolf, Department of Revenue.

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ADP MASTER PLAN



USER APPLICATION WORKLOAD

The following sample of forms reflect the ADP resources requirements for each of the three existing computer centers to support the Users projected application workload requirements during the planning period. Department of Social Services' workload is reflected with and without Medical Management Information System (MMIS) and Monthly Reporting Experimental System (MRE).

Conservation and sheer volume of the forms prohibits the inclusion of all the forms in this report. Persons who are interested in further clarification and detail information may review these forms in the associated computer center.

The Department of Revenue's application workload forms and related terminal characteristics are on file at the Capitol Annex Building, 1375 Sherman Street.

The Department of Social Services' application workload forms and related terminal characteristics forms are on file at the Social Services Building, 1575 Sherman Street.

The Division of ADP's application workload forms and related terminal characteristics forms are on file at 2002 South Colorado Boulevard.

EXHIBIT 8
FOIA #2

8-2
APPLICATION: CHARACTERISTICS
ILLUSTRATION: 1

PERIOD OF TIME: Fiscal Yr. 1977-78 thru 1982-83
COMPUTER CENTER: Department of Revenue

SAMPLE																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										
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EXHIBIT B
10-11-82B-3
APPLICATION CHARACTERISTICS
ILLUSTRATION 1PERIOD OF TIME: Fiscal Yr. 1977-78 thru 1982-83
COMPUTER CENTER: Department of Revenue

SAMPLE

SAMPLE																				
FISCAL YEAR	APPLICATION NAME	TYPE OF APPLICATION	SCHEDULE				RUN TIME				DEVICE ALLOCATION				DISK ACCESS METHOD	T/P MONITOR	DAYS	TURN AROUND TIME	# OF TAPES	# OF INITIAL
			*2	FREQ	START	STOP	WEEK	CPU	# TAPES	BYTES OF DISK	OF 3330-10	3330-11	PAGE/FOR PRINTED							
1981-82	MAJOR TAX	Batch	DA	8:00	17:00	300	60	4	Work	3 Packs	500	ISAM	2 hrs	CICS	ISAM	24 hrs	Instant	49		
		"	WK	17:00	8:00	1800	850	6	Work	3 Packs	10,000	ISAM	55 hrs							
		"	MO	17:00	8:00	1000	150	4	Work	3 Packs	1,250,000	ISAM	65 hrs							
		"	QTR	17:00	8:00	40	10	4	Work	3 Packs	2,000	ISAM	55 hrs							
		"	YR	17:00	8:00	50	40	5	Work	3 Packs	2,000	ISAM	55 hrs							
1982-83	MAJOR TAX	Batch	DA	8:00	17:00	2250	750	4	Work	3 Packs	32,000	ISAM	24 hrs	CICS	ISAM	24 hrs	Instant	70		
		"	WK	17:00	8:00	1800	850	6	Work	3 Packs	10,000	ISAM	55 hrs							
		"	MO	17:00	8:00	1000	150	4	Work	3 Packs	1,370,000	ISAM	65 hrs							
		"	QTR	17:00	8:00	40	10	4	Work	3 Packs	2,000	ISAM	55 hrs							
		"	YR	17:00	8:00	50	40	5	Work	3 Packs	36,000	ISAM	24 hrs							
		On-line T/P	DA	8:00	17:00	2250	1980	1	Work	3 Packs	1,420,500	ISAM	Instant	CICS	ISAM	Instant		70		
		"	WK	17:00	8:00	1800	850	6	Work	3 Packs	10,000	ISAM	55 hrs							
		"	MO	17:00	8:00	1000	150	4	Work	3 Packs	1,370,000	ISAM	65 hrs							
		"	QTR	17:00	8:00	40	10	4	Work	3 Packs	2,000	ISAM	55 hrs							
		"	YR	17:00	8:00	50	40	5	Work	3 Packs	36,000	ISAM	24 hrs							

NOTE: See Illustration 2 for Recap of All Applications by Fiscal Year.

EXHIBIT B

DEPARTMENT OF REVENUE
APPLICATION RECAP
ILLUSTRATION 2YEAR 77-78

APPLICATION	CENTRAL PROCESSOR UNIT HOURS (CPU)	BYTE DISK
Major Tax	1,024.55	NONE
Income Tax	1,162.07	NONE
Drivers Licence	977.49	1,200,000,000
Motor Vehicle	285.77	510,000,000
Distrain Warrants	290.06	WORK
Accident Reporting	150.60	100,000
Inheritance Tax	112.19	WORK
Liquor Tax	3.85	WORK
Motor Fuel Refunds	16.0	
Patrol Tickets	32.21	
Motor Fuel Bills of Lading Ports of Entry	179.33	100,000
Expense Vouchers	10.33	
ABL Variance Reports	4.58	
Proration	41.9	
Product Control	74.50	
Internal Admin.	255.10	
Video	251.0	150,000,000
Doris (CICS)	124.0	50,000,000
System Software	70	300,000,000
		125,000,000
TOTAL	5,065.53	2,335,200,000

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EXHIBIT B

DEPARTMENT OF REVENUE
APPLICATION RECAP
ILLUSTRATION 2

YEAR 78-79

APPLICATION	CENTRAL PROCESSOR UNIT HOURS (CPU)	BYTE DISK
Major Tax	1,539.0	400,000,000
Income Tax	1,282.7	600,000,000
Drivers Licence	1,075.24	1,320,000,000
Motor Vehicle	312.80	561,000,000
Distrainment Warrants	316.0	WORK
Accident Reporting	159.58	110,000
Inheritance Tax	117.80	WORK
Liquor Tax	4.50	WORK
Motor Fuel Refunds	16.8	
Patrol Tickets	33.82	
Motor Fuel Bills of Lading Ports of Entry	198.39	110,000
Expenditure Vouchers	10.85	
ABL Variance Reports	4.82	
Proration	45.9	
Product Control	92.75	
Internal Admin.	265.75	
Video		157,500,000
Doris (CICS)	413	52,500,000
System Software	260	350,000,000
		130,000,000
TOTAL	6,149.70	3,571,220,000

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ADP MASTER PLAN

EXHIBIT B

DEPARTMENT OF REVENUE
APPLICATION RECAP
ILLUSTRATION S

YEAR 79-80

APPLICATION	CENTRAL PROCESSOR UNIT HOURS (CPU)	BYTE DISK
Major Tax	1,500	440,000,000
Income Tax	1,349.2	630,000,000
Drivers Licence	1,182.77	1,452,000,000
Motor Vehicle	335.63	617,100,000
Distrain Warrants	345.0	WORK
Accident Reporting	167.25	121,000
Inheritance Tax	123.69	WORK
Liquor Tax	4.87	WORK
Motor Fuel Refunds	17.6	
Patrol Tickets	35.51	
Motor Fuel Bills of Lading Ports of Entry	220.0	121,000
Expenditure Vouchers	11.39	
ABL Variance Reports	5.05	
Proration	49.2	
Product Control	104.75	
Internal Admin.	278.14	
Video		165,370,000
Doris (CICS)	454	55,125,000
System Software	260	350,000,000
		135,100,000
TOTAL	6,624.05	3,844,937,000

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ADP MASTER PLAN

EXHIBIT B

DEPARTMENT OF REVENUE
APPLICATION RECAP
ILLUSTRATION 2

YEAR 80-81

APPLICATION	CENTRAL PROCESSOR UNIT HOURS (CPU)	BYTE DISK
Major Tax	1,790	484,000,000
Income Tax	1,417.5	661,500,000
Drivers Licence	1,306.04	1,597,200,000
Motor Vehicle	364.99	678,810,000
Distrain Warrants	376.0	WORK
Accident Reporting	170.26	133,100
Inheritance Tax	129.87	WORK
Liquor Tax	5.24	WORK
Motor Fuel Refunds	18.5	
Patrol Tickets	37.28	
Motor Fuel Bills of Lading Ports of Entry	247.0	133,100
Expenditure Vouchers	11.96	
ABL Variance Reports	5.31	
Proration	55.2	
Product Control	114.75	
Internal Admin.	291.55	
Video		173,630,000
Doris (CICS)	499	57,888,125
System Software	265	350,000,000
		140,000,000
TOTAL	7105.45	4,143,294,325

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STATE OF
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ADP MASTER PLAN

EXHIBIT B

 DEPARTMENT OF REVENUE
 APPLICATION RECAP
 ILLUSTRATION 2

YEAR 81-82

APPLICATION	CENTRAL PROCESSOR UNIT HOURS (CPU)	BYTE DISK
Major Tax	1,930	532,400,000
Income Tax	1,481.9	729,300,000
Drivers Licence	1,431.15	1,756,910,000
Motor Vehicle	415.47	746,691,000
Distraint Warrants	410.0	WORK
Accident Reporting	173.20	146,100
Inheritance Tax	136.36	WORK
Liquor Tax	5.61	WORK
Motor Fuel Refunds	19.4	
Patrol Tickets	39.14	
Motor Fuel Bills of Lading Ports of Entry	273.0	146,100
Expenditure Vouchers	12.56	
ABL Variance Reports	5.57	
Proration	60.1	
Product Control	131.0	
Internal Admin.	306.98	
Video		182,310,000
Doris (CICS)	549	60,770,000
System Software	270	350,000,000
		145,000,000
TOTAL	7,650.44	4,503,673,200

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STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT B

DEPARTMENT OF REVENUE
APPLICATION RECAP
ILLUSTRATION 2YEAR 82-83

APPLICATION	CENTRAL PROCESSOR UNIT HOURS (CPU)	BYTE DISK
Major Tax	1,980	585,640,000
Income Tax	1,549.9	765,760,000
Drivers Licence	1,574.26	1,932,500,000
Motor Vehicle	442.95	821,360,100
Distraint Warrants	446.0	WORK
Accident Reporting	175.35	161,050
Inheritance Tax	143.20	WORK
Liquor Tax	5.98	WORK
Motor Fuel Refunds	20.4	
Patrol Tickets	41.09	
Motor Fuel Bills of Lading Ports of Entry	302.0	161,050
Expenditure Vouchers	13.19	
ABL Variance Reports	5.86	
Proration	66.5	
Product Control	142.0	
Internal Admin.	323.43	
Video		191,420,000
Doris (CICS)	604	63,808,500
System Software	275	350,000,000
		150,000,000
TOTAL	8,111.11	4,860,810,700

1978



ADP MASTER PLAN

EXHIBIT B

DEPARTMENT OF REVENUE
 RECAP OF FISCAL YEARS
 ILLUSTRATION 3

FISCAL YEAR	CPU HOURS	BYTES OF DISK	NBR TERMINALS
1977-78	5,065.53	2,335,200,000	102 (8)*
78-79	6,149.70	3,571,200,000	126 (14)
79-80	6,624.05	3,844,937,000	146 (15)
80-81	7,105.45	4,143,294,325	175 (16)
81-82	7,650.44	4,503,673,200	210 (17)
82-83	8,111.11	4,860,810,700	252 (20)

* () indicates number of terminal printers.

EXHIBIT B
FOIA #2

B-31
APPLICATION CHARACTERISTICS
ILLUSTRATION 1

PERIODS OF TIME: Fiscal Yr. 1977-78 thru 1982-83
COMPTON CENTER; Department of Social Services

SAIFLL

FISCAL YEAR	APPLICATION NAME	TYPE OF APPLICATION	SCHEDULE	EXP. TIME		DEVICE ALLOCATION		T/P	ACCESS METHOD	PAGE OF	PAGE NO.	TIME
				FREQ	START - STOP	WALL CLOCK	TAPE					
77-78	Title XX, Social Services	Daily Semi-M Monthly Quar Semi-A Annual		43.5 31.1 14.2 1.7 24.2 7.9 1.1 .4 .1	22.1 14.2 3 3 3 2 3 3 1	10,000,000		CICS	VSAM	810,000 1,375,000 1,717,000 109,000 264,000 900	16 hrs	1
78-79	Title XX, Social Services	D SW X X SA A		50. 45. 15. 6. 2. 32. 8. 2. .5 .1	25. 15. 3 3 3 2 3 1	12,000,000		CICS	VSAM	820,000 1,890,000 1,720,000 101,500 270,000 1,600	16 hrs	1
79-80	Title XX, Social Services	D SW M Q SA A		52. 37. 17. 6. 2. 33. 9. 2. .5 .1	27. 17. 3 3 3 2 3 1	12,000,000		CICS	VSAM	850,000 1,910,000 1,860,000 106,000 240,000 1,100	16 hrs	1
80-81	Title XX, Social Services	D SW M Q SA A		55. 50. 18. 6. 35. 10. 2. .5 .1	29. 18. 4 3 3 2 3 1	12,000,000		CICS	VSAM	875,000 1,950,000 1,870,000 107,000 237,000 1,100	16 hrs	1
80-82	Title XX, Social Services	D SW M Q SA A		57. 52. 19. 7. 2. 36. 10. 2. .5 .1	30. 19. 3 3 3 2 3 1	12,000,000		CICS	VSAM	900,000 1,990,000 1,890,000 111,000 297,000 1,100	16 hrs	1

1978

ADP MASTER PLAN

EXHIBIT B
FORM #2B-12
APPLICATION CHARACTERISTICS
ILLUSTRATION 1PERIOD OF TIME: Fiscal Yr. 1977-78 thru 1982-83
COMPUTER CENTER: Department of Social Services

SAMPLE

FISCAL YEAR	APPLICATION NAME	TYPE OF APPLICATION	SCHEDULE		CPU TIME		DEVICE ALLOCATION		DISK ACCESS METHOD	T/P PORTION	DAYS	TOTAL TIME	*3 OF TOTAL
			FREQ	START - STOP	CALL CLOCK	CPU	TAPE	BYTES OF DISK OR 3330-100 3330-111					
1982-83	Title XX, Social Services		Daily		60	31	4	12,000,000	965,000	VSM	CICS	16 hrs	1
			Seal-w		54	20			2,089,500				
			Monthly		7.1	2	3		1,564,500				
			Quar		36	11	3		116,550				
			Semi-A		2	.5	3		311,850				
			Annual		.1	.1	1		1,155				

NOTE: See Illustration 2 for Recap of All Applications by Fiscal Year.

EXHIBIT B

DEPARTMENT OF SOCIAL SERVICES
APPLICATION RECAP
ILLUSTRATION 2

YEAR 77-78

APPLICATION	CPU HOURS		BYTES OF DISK		NBR TERMINALS	
	-MMIS	+MMIS	-MMIS/MRE	+MMIS/MRE	-MMIS	+MMIS
1. Accounting	51.40	51.40	10,000,000	10,000,000		
2. Income Maint./ Medical Eligib.	1264.01 450.89	1264.01 450.89	200,000,000 100,000,000	200,000,000 100,000,000	21 3	21 3
3. Medical Assist.	357.61	570.47	-0-	300,000,000		
4. Social Services	46.50	46.50	10,000,000	10,000,000	1	1
5. Child Support	15.20	15.20	1,400,000	1,400,000		
6. Personnel	10.23	10.23	-0-	-0-		
7. Quality Control	1.20	1.20	-0-	-0-		
8. Voc. Rehab.	154.80	154.80	50,000,000	50,000,000	4	4
9. System Maint.	675.00	675.00	1,090,000,000	1,090,000,000	8	8
TOTAL	3026.84	3239.70	1,461,400,000	1,761,400,000	37	37

1978

STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT B

DEPARTMENT OF SOCIAL SERVICES
APPLICATION RECAP
ILLUSTRATION 2

YEAR 78-79

APPLICATION	CPU HOURS		BYTES OF DISK		NBR TERMINALS	
	-MMIS	+MMIS	-MMIS/MRE	+MMIS/MRE	-MMIS	+MMIS
1. Accounting	56.00	56.00	12,000,000	12,000,000	1	1
2. Income Maint./ Medical Eligib.	1309.00 1280.45	1309.00 2270.00	400,000,000	500,000,000	28 5	28 5
3. Medical Assist.	268.30	1768.30	400,000	400,000	1	1
4. Social Services	50.60	50.60	12,000,000	12,000,000		
5. Child Support	60.00	60.00	1,420,000	1,420,000		
6. Personnel	10.23	10.23				
7. Quality Control	1.22	1.22				
8. Voc. Rehab.	163.20	163.20	50,000,000	50,000,000	4	4
9. System Maint.	600.00	975.00	1,090,000,000	1,690,000,000	8	8
TOTAL	3799.00	6663.55	1,565,820,000	2,265,820,000	47	47

1978

STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT B

DEPARTMENT OF SOCIAL SERVICES
APPLICATION RECAP
ILLUSTRATION 2

YEAR 79-80

APPLICATION	CPU HOURS		BYTES OF DISK		NBR TERMINALS	
	-MMIS	+MMIS	-MMIS/MRE	+MMIS/MRE	-MMIS	+MMIS
1. Accounting	61.00	61.00	14,000,000	14,000,000	1	1
2. Income Maint./ Medical Eligib. MRE	1321.00	1321.00 2270.00	400,000,000	400,000,000 250,000,000	23 0	28 3
3. Medical Assist.	400.00	3000.00	0	1,000,000,000	0	10
4. Social Services	55.60	55.60	12,000,000	12,000,000	1	1
5. Child Support	66.00	66.00	1,440,000	1,440,000		
6. Personnel	10.23	10.23				
7. Quality Control	1.34	1.34				
8. Voc. Rehab.	170.80	170.80	50,000,000	50,000,000	4	4
9. System Maint.	600.00	1055.00	1,200,000,000	2,120,000,000	8	8
TOTAL	2685.97	8010.97	1,677,440,000	3,847,440,000	42	55

1978

STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT B

DEPARTMENT OF SOCIAL SERVICES
APPLICATION RECAP
ILLUSTRATION 2

YEAR 80-81

APPLICATION	CPU HOURS		BYTES OF DISK		NBR TERMINALS	
	-MMIS	+MMIS	-MMIS/MRE	+MMIS/MRE	-MMIS	+MMIS
1. Accounting	68.00	68.00	15,000,000	15,000,000	1	1
2. Income Maint./ Medical Eligib. MRE	1350.00	5500.00	425,000,000	1,000,000,000	61	28
3. Medical Assist.	450.00	3300.00		1,100,000,000	0	10
4. Social Services	59.60	59.60	12,000,000	12,000,000	1	1
5. Child Support	68.00	68.00	1,450,000	1,450,000		
6. Personnel	10.23	10.23				
7. Quality Control	1.46	1.46				
8. Voc. Rehab.	179.30	179.30	50,000,000	50,000,000	4	4
9. System Maint.	855.00	855.00	1,250,000,000	1,600,000,000	8	8
TOTAL	3041.59	10,041.59	1,753,450,000	3,778,450,000	42	85

1978

STATE OF
COLORADO

ADP MASTER PLAN

DEPARTMENT OF SOCIAL SERVICES
APPLICATION RECAP
ILLUSTRATION 2

YEAR 81-82

APPLICATION	CPU HOURS		BYTES OF DISK		NBR TERMINALS	
	-MMIS	+MMIS	-MMIS/MRE	+MMIS/MRE	-MMIS	+MMIS
1. Accounting	131.00	131.00	15,000,000	15,000,000	1	1
2. Income Maint./ Medical Eligib. MRE	1400.00	5500.00	450,000,000	1,300,000,000	28	61
3. Medical Assist.	457.36	3350.00		1,150,000,000	0	10
4. Social Services	61.60	61.60	12,000,000	12,000,000	1	1
5. Child Support	70.00	70.00	1,470,000	1,470,000		
6. Personnel	10.23	10.23				
7. Quality Control	1.61	1.61				
8. Voc. Rehab.	188.20	188.20	50,000,000	50,000,000	4	4
9. System Maint.	855.00	855.00	1,300,000,000	1,600,000,000	8	8
TOTAL	3175.00	10167.64	1,828,470,000	4,128,470,000	42	85

EXHIBIT B

DEPARTMENT OF SOCIAL SERVICES
APPLICATION RECAP
ILLUSTRATION 2YEAR 82-83

APPLICATION	CPU HOURS		BYTES OF DISK		NBR TERMINALS	
	-MMIS	+MMIS	-MMIS/MRE	+MMIS/MRE	-MMIS	+MMIS
1. Accounting	68.00	68.00	15,000,000	15,000,000	1	1
2. Income Maint./ Medical Eligib. MRE	1450.00	5900.00	450,000,000	1,500,000,000	28	61
3. Medical Assist.	610.00	3400.00		1,175,000,000		10
4. Social Services	64.60	64.60	12,000,000	12,000,000	1	1
5. Child Support	74.00	74.00	1,490,000	1,490,000		
6. Personnel	10.23	10.23				
7. Quality Control	1.76	1.76				
8. Voc. Rehab.	197.50	197.50	50,000,000	50,000,000	4	4
9. System Maint.	855.00	855.00	1,350,000,000	1,600,000,000	8	8
TOTAL	3331.09	10571.09	1,878,490,000	4,353,490,000	42	85

NOTE: See illustration 3 for recap by fiscal year.

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STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT B

DEPARTMENT OF SOCIAL SERVICES
 RECAP OF FISCAL YEAR
 ILLUSTRATION 3

FISCAL YEAR	CPU HOURS		BYTES OF DISK		NBR OF TERMINALS	
	-MMIS	+MMIS	+MMIS	+MMIS	-MMIS	+MMIS
1977-78	3,026.84	3,239.70	1,461,400,000	1,761,400,000	37	37
78-79	3,799.00	6,663.55	1,565,820,000	2,265,820,000	47	47
79-80	2,685.97	8,010.97	1,677,440,000	3,847,440,000	42	55
80-81	3,041.59	10,041.59	1,753,450,000	3,778,450,000	42	85
81-82	3,175.00	10,167.64	1,828,470,000	4,128,470,000	42	85
82-83	3,331.09	10,571.09	1,878,490,000	4,353,490,000	42	85

EXHIBIT B
FOR: #2B-20
APPLICATION CHARACTERISTICS
ILLUSTRATION 1PERIOD OF TIME: Fiscal Yr. 1977-78 thru 1982-83
COMPUTER CENTER: DIVISION OF ADP

SAMPLE

FISCAL YEAR	APPLICATION NAME	TYPE OF APPLICATION	#2 FREQ	SCHEDULE START - END	WALL CLOCK	CPU TIME	# TAPES	BYTES ON DISK or 3330-11	INVOICE ALLOCATION	PAGE/TIME PRINTED	DISK ACCESS METHOD	T/P MONITOR	ESTIMATED TIME	# OF TAPES
1977-78	Division of Insurance: Licensing, Renewal, Certification, Complaint, and Activity Reports TOTAL	Batch	Daily	5 PM - 8 AM	12.00	12.00	2	100,000		182,300			15 hrs	
		"	Weekly	5 PM - 8 AM	1.00	1.00	1			10,000			"	
		"	Monthly	5 PM - 8 AM	1.00	1.00	2			39,700			"	
		"	Yearly	5 PM - 8 AM	25.00	25.00	2	100,000		1,233,400			"	
1978-79	Division of Insurance: Licensing, Renewal, Certification, Complaint, and Activity Reports TOTAL	Batch	Daily	5 PM - 8 AM	46.20	46.20	2	110,000		420,500			15 hrs	
		"	Weekly	5 PM - 8 AM	1.10	1.10	1			11,000			"	
		"	Monthly	5 PM - 8 AM	7.40	7.40	2			43,600			"	
		"	Yearly	5 PM - 8 AM	27.50	27.50	2	110,000		1,350,700			"	
1979-80	Division of Insurance: Licensing, Renewal, Certification, Complaint, and Activity Reports	Batch	Weekly	5 PM - 8 AM	1.21	1.21	1			12,100			15 hrs	
		"	Monthly	5 PM - 8 AM	4.84	4.84	2			48,030			"	
		Remote Batch	Daily	5 PM - 8 AM	50.82	50.82	1			462,580		CICS	"	
		Remote Batch	Yearly	5 PM - 8 AM	30.25	30.25	1			1,490,410		CICS	"	
	On-line T/P		Daily	5 PM - 8 AM	20.00	20.00		17,955,000		2,013,130	VSAM		0-20 sec	2

1978

STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT B
FORM #2B-1
APPLICATION CHARACTERISTICS
ILLUSTRATION 1PERIOD OF TIME: Fiscal Yr. 1977-78 thru 1982-83
LOCATION: Division of AUP

SAMPLE

FISCAL YEAR	APPLICATION NAME	TYPE OF APPLICATION	*1 FREQ	SCHEDULE START - STOP	DAILY TIME CLOCK	CPU TAPES	BYTES OF DISK or 3330-10r 3330-111	DISK ACCESS METHOD	T/P MONITOR	DEMS	*2 PROCESSING TIME	*3 OF TEN- MINUTE INTERVAL
1980-81	Division of Insurance: Licensing, Renewal, Certifi- cation, Complaint, and Activity Report	Batch	Weekly	5 PM 8 AM		1.33					15 hrs	
		Batch	Monthly	5 PM 8 AM		5.33					"	
		Batch	Daily	5 PM 8 AM		55.7					"	
		Batch	Yearly	5 PM 8 AM		24.2					"	
		Batch	Daily	8 AM 5 PM		20.0	19,750,500	VSAM	CICS		0-20 sec	
	TOTAL					117.9	19,750,500					
1981-82	Division of Insurance: Licensing, Renewal, Certifi- cation, Complaint, and Activity Report	Batch	Weekly	5 PM 8 AM		1.40					15 hrs	
		Batch	Monthly	5 PM 8 AM		5.89					"	
		Batch	Daily	5 PM 8 AM		61.4					"	
		Batch	Yearly	5 PM 8 AM		36.6					"	
		Batch	Daily	8 AM 5 PM		24.2	20,250,000	VSAM	CICS		0-20 sec	
	TOTAL					109.5	20,250,000					
1982-83	Division of Insurance: Licensing, Renewal, Certifi- cation, Complaint, and Activity Report	Batch	Weekly	5 PM 8 AM		1.61					15 hrs	
		Batch	Monthly	5 PM 8 AM		6.44					"	
		Batch	Daily	5 PM 8 AM		67.64					"	
		Batch	Yearly	5 PM 8 AM		40.27					"	
		Batch	Daily	8 AM 5 PM		26.64	22,275,000	VSAM	CICS		0-20 sec	
	TOTAL					142.56	22,275,000					

NOTE: See Illustration 2 for Recap of All Applications by Fiscal Year.

EXHIBIT B

DIVISION OF ADP
APPLICATION RECAP
ILLUSTRATION 2YEAR 77-78

APPLICATION	CPU	BYTES DISK	#TERMINALS
INSURANCE	72.00	100,000	
ACCOUNTS AND CONTROL	762.64	136,000,000	2
AUTOMATED DATA PROCESSING	850.00	1,100,000,000	9
PURCHASING	2.00	---	-
COMMUNICATIONS	17.00	---	-
AGRICULTURE	9.00	55,000	1
EDUCATION	234.00	5,500,000	1
HEALTH	385.00	52,377,000	5
METRO STATE COLLEGE	1,340.00	94,441,440	18
STATE BOARD OF COMM. COLLEGES	190.00	30,780,000	3
ARAPAHOE COMMUNITY COLLEGE	109.00	10,900,000	1
COMMUNITY COLLEGE OF DENVER	796.50	155,286,000	1
HIGHWAYS	287.50	24,000,000	4
EMPLOYMENT	96.00	---	-
LABOR	64.43	85,000,000	3
PROPERTY TAXATION	6.35	600,000	-
NATURAL RESOURCES	226.00	20,000,000	1
PERSONNEL	115.50	75,000,000	7
REGULATORY AGENCIES	43.00	4,000,000	2
LEGISLATIVE DRAFTING	375.00	400,000,000	24
SECRETARY OF STATE	159.00	130,000,000	10
TREASURY	105.00	8,254	-
PLANNING AND BUDGET	52.00	108,500,000	1
OTHER	<u>65.00</u>	<u>3,000,000</u>	<u>-</u>
TOTAL	6,361.92	2,435,547,694	93

1978
STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT B

DIVISION OF ADP
APPLICATION RECAP
ILLUSTRATION 2

YEAR 78-79

APPLICATION	CPU	BYTES DISK	#TERMINALS
INSURANCE	79.20	110,000	-
ACCOUNTS AND CONTROL	795.88	149,600,000	5
AUTOMATED DATA PROCESSING	933.00	1,210,000,000	10
PURCHASING	74.00	16,800,000	1
COMMUNICATIONS	17.85	---	-
AGRICULTURE	51.90	4,500,000	2
EDUCATION	232.00	6,000,000	1
HEALTH	484.00	82,401,000	8
METRO STATE COLLEGE	1,780.00	128,319,440	23
STATE BOARD OF COMM. COLLEGES	220.55	35,447,000	3
ARAPAHOE COMMUNITY COLLEGE	151.00	18,400,000	2
COMMUNITY COLLEGE OF DENVER	883.00	206,816,000	4
HIGHWAYS	275.50	25,000,000	4
EMPLOYMENT	118.00	34,000,000	2
LABOR	65.70	135,150,000	3
PROPERTY TAXATION	7.35	700,000	-
NATURAL RESOURCES	271.25	35,000,000	4
PERSONNEL	134.50	110,000,000	11
REGULATORY AGENCIES	60.00	4,400,000	4
LEGISLATIVE DRAFTING	417.00	480,000,000	26
SECRETARY OF STATE	368.00	153,000,000	17
TREASURY	116.00	8,254	-
PLANNING AND BUDGET	64.20	120,260,000	2
OTHER	65.00	3,000,000	-
TOTAL	7,664.88	2,958,911,694	132

1978
STATE OF
COLORADO

ADP MASTER PLAN

DIVISION OF ADP
APPLICATION RECAP
ILLUSTRATION 2

PAGE 79-80

APPLICATION	CPU	BYTES DISK	TERMINALS
INSURANCE	107.12	17,955,000	2
ACCOUNTS AND CONTROL	835.07	164,560,000	7
AUTOMATED DATA PROCESSING	1,026.00	1,331,000,000	10
PURCHASING	81.00	17,220,000	1
COMMUNICATIONS	40.00	---	-
AGRICULTURE	60.00	10,000,000	2
EDUCATION	254.50	11,272,000	1
HEALTH	671.00	142,790,320	12
METRO STATE COLLEGE	1,960.00	145,258,440	28
STATE BOARD OF COMM. COLLEGES	254.10	40,764,050	3
ARAPAHOE COMMUNITY COLLEGE	183.65	29,400,000	2
COMMUNITY COLLEGE OF DENVER	972.00	227,497,000	7
HIGHWAYS	333.50	28,000,000	4
EMPLOYMENT	173.20	37,400,000	2
LABOR	129.40	146,150,000	8
PROPERTY TAXATION	12.60	800,000	1
NATURAL RESOURCES	288.00	38,000,000	4
PERSONNEL	182.00	142,000,000	26
REGULATORY AGENCIES	67.00	4,840,000	6
LEGISLATIVE DRAFTING	459.00	560,000,000	26
SECRETARY OF STATE	492.00	153,000,000	21
TREASURY	151.00	8,254	-
PLANNING AND BUDGET	279.62	632,286,000	5
OTHER	71.00	3,000,000	-
TOTAL	9,082.76	3,883,201,064	178

EXHIBIT B

DEPARTMENT OF ADP
APPLICATION RECAP
ILLUSTRATION 2

YEAR 80-81

APPLICATION	CFU	BYTES DISK	TERMINALS
INSURANCE	117.83	19,750,500	4
ACCOUNTS AND CONTROL	884.76	181,016,000	11
AUTOMATED DATA PROCESSING	1,128.00	1,464,000,000	10
PURCHASING	88.00	17,650,500	1
COMMUNICATIONS	42.00	---	-
AGRICULTURE	66.90	46,100,000	4
EDUCATION	254.50	14,022,000	1
HEALTH	848.00	288,469,500	12
METRO STATE COLLEGE	2,330.00	153,727,940	31
STATE BOARD OF COMM. COLLEGES	292.25	46,878,657	3
ARAPAHOE COMMUNITY COLLEGE	209.45	36,100,000	2
COMMUNITY COLLEGE OF DENVER	1,069.00	250,248,000	13
HIGHWAYS	380.50	28,100,000	4
EMPLOYMENT	180.50	41,100,000	2
LABOR	119.90	176,150,000	8
PROPERTY TAXATION	13.75	900,000	1
NATURAL RESOURCES	302.40	40,000,000	4
PERSONNEL	271.50	143,000,000	57
REGULATORY AGENCIES	74.00	5,200,000	6
LEGISLATIVE DRAFTING	501.00	640,000,000	26
SECRETARY OF STATE	518.00	167,948,920	21
TREASURY	166.00	8,254	-
PLANNING AND BUDGET	254.58	552,432,100	7
OTHER	71.00	3,000,000	-
TOTAL	10,183.82	4,315,802,371	228

1978
STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT B

DIVISION OF ADP
APPLICATION RECAP
ILLUSTRATION 2

YEAR 81-82

APPLICATION	CPU	BYTES DISK	TERMINALS
INSURANCE	129.61	20,250,000	5
ACCOUNTS AND CONTROL	694.38	199,117,000	18
AUTOMATED DATA PROCESSING	1,239.00	1,610,000,000	10
PURCHASING	96.00	18,091,762	1
COMMUNICATIONS	44.10	---	-
AGRICULTURE	77.40	51,700,000	8
EDUCATION	248.00	16,022,000	1
HEALTH	826.00	268,270,100	12
METRO STATE COLLEGE	2,550.00	156,985,440	35
STATE BOARD OF COMM. COLLEGES	336.10	53,910,453	3
ARAPAHOE COMMUNITY COLLEGE	238.95	41,100,000	2
COMMUNITY COLLEGE OF DENVER	1,175.00	275,272,000	13
HIGHWAYS	428.50	28,100,000	4
EMPLOYMENT	188.50	45,200,000	2
LABOR	121.70	206,000,000	8
PROPERTY TAXATION	15.06	1,000,000	1
NATURAL RESOURCES	317.45	42,000,000	4
PERSONNEL	306.70	166,000,000	57
REGULATORY AGENCIES	81.00	5,700,000	6
LEGISLATIVE DRAFTING	554.00	720,000,000	26
SECRETARY OF STATE	545.00	168,674,220	21
TREASURY	183.00	8,254	-
PLANNING AND BUDGET	280.04	607,675,310	8
OTHER	79.00	3,000,000	-
TOTAL	10,754.49	4,704,076,539	245

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STATE OF
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ADP MASTER PLAN

EXHIBIT B

DIVISION OF ADP
APPLICATION RECAP
ILLUSTRATION 2

YEAR 82-83

APPLICATION	CPU	BYTES DISK	#TERMINALS
INSURANCE	142.58	22,275,000	5
ACCOUNTS AND CONTROL	677.53	219,030,000	18
AUTOMATED DATA PROCESSING	1,361.00	1,771,000,000	10
PURCHASING	104.00	18,544,000	2
COMMUNICATIONS	46.30	---	-
AGRICULTURE	119.00	68,800,000	12
EDUCATION	265.00	18,772,000	1
HEALTH	803.00	358,272,800	13
METRO STATE COLLEGE	2,780.00	163,500,440	37
STATE BOARD OF COMM. COLLEGES	386.45	61,997,019	3
ARAPAHOE COMMUNITY COLLEGE	276.20	49,800,000	2
COMMUNITY COLLEGE OF DENVER	1,292.00	302,798,000	13
HIGHWAYS	454.50	29,225,000	4
EMPLOYMENT	197.20	49,700,000	2
LABOR	123.90	238,000,000	8
PROPERTY TAXATION	16.09	1,100,000	1
NATURAL RESOURCES	333.30	44,000,000	4
PERSONNEL	349.10	195,500,000	58
REGULATORY AGENCIES	88.00	6,200,000	6
LEGISLATIVE DRAFTING	607.00	800,000,000	26
SECRETARY OF STATE	574.00	183,189,070	22
TREASURY	201.00	8,254	-
PLANNING AND BUDGET	308.05	668,453,841	8
OTHER	79.00	3,000,000	-
TOTAL	11,584.20	5,273,165,480	255

NOTE: See Illustration 3 for Recap by Fiscal Years.

DIVISION OF ADP
RECAP BY FISCAL YEARS
ILLUSTRATION 3

FISCAL YEAR	CPU HOURS	BYTES OF DISK	NRB TERMINALS
1977-78	6,361.92	2,435,547,694	93
1978-79	7,664.88	2,958,911,694	132
1979-80	9,082.76	3,883,201,064	178
1980-81	10,183.82	4,315,802,371	223
1981-82	10,754.49	4,704,076,539	245
1982-83	11,584.20	5,273,165,480	255

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ADP MASTER PLAN

METHOD OF PROJECTING COSTS

The costs represented in each alternative are based upon the user projections for the next five years converted to dollar requirements. The task force chose four major groupings of cost: computer equipment, vendor software, personnel and other operating costs. Each using agency supplied five year projections of workload - CPU, tape, disk, communications, terminals, and print lines - and cost information. Additionally, each existing organization prepared supporting budgets for the cost elements for five years. Alternative One was the base for all future calculations.

The task force validated the Alternative One requirement relative to the user budget projections. Adjustments were discussed and agreed to by the task force and the user. This process resulted in 5-year budget projections for each existing computer facility. Alternatives Two and Three represent two degrees of consolidation or centralization. In order to arrive at projected costs for these two alternatives using the Alternative One requirements, the task force first adjusted the Alternative One costs to reflect the savings in CPU and personnel. These adjustments provided a base line cost for Alternative Two and Three. Then every other item or component of cost in each of the four major groupings for Alternative One was examined to determine if it should be eliminated, expanded, or remain the same in Alternative Two and Three.

This process provided additional adjustments to the Alternatives Two and Three. Also, this process exposed some new cost which would apply to Alternative Two and Three which do not exist in Alternative One. Site preparation and moving costs were not present in Alternative One, but were added in Alternatives Two and Three.

Table 1 shows Alternative One by each major cost group, for the total cost of the three agencies for the five years. Table 2 shows the combined base, adjusted for CPU and personnel changes for Alternatives Two and Three. Table 3 shows the adjustments made to the base totals and the new net adjusted Alternative Two and Three costs. Table 3 shows the comparison of the net adjusted Alternative One, Two and Three costs by fiscal year; the total for the five years; and the difference between the three computing alternatives on a year by year and total 5-year basis.

TABLE 1
ALTERNATIVE ONE COSTS FOR FY 78-79 THROUGH FY 82-83
(in dollars)

AGENCY/COST GROUP	FY 78-79	FY 79-80	FY 80-81	FY 81-82	FY 82-83	TOTAL
OSP-Equipment	1,150,831	1,263,410	1,265,069	1,303,586	1,359,574	6,342,450
Software	80,000	55,120	58,427	61,933	65,649	321,129
Personnel	1,937,919	1,994,514	2,050,669	2,084,842	2,119,409	10,187,353
Operating	247,765	215,930	265,930	315,623	347,185	1,413,423
Total OSP	3,416,515	3,529,974	3,641,035	3,766,084	3,991,817	16,293,379
OSP-Equipment	1,064,473	1,593,452	1,233,517	1,402,165	1,576,009	6,374,616
Software	34,258	37,633	41,452	45,599	50,159	209,151
Personnel	2,903,924	2,926,557	2,939,667	2,997,307	3,026,775	14,895,350
Operating	438,065	336,611	362,272	403,059	441,405	2,037,456
Total OSP	4,440,720	4,894,313	4,632,906	4,847,970	5,104,348	23,479,562
OSS - Equipment	1,034,557	929,375	1,019,739	1,033,539	1,033,519	5,050,740
Software	29,270	89,270	41,270	41,270	41,270	242,350
Personnel	1,264,587	1,323,043	1,328,043	1,328,043	1,328,043	6,577,659
Operating	852,706 *	192,994	202,633	212,765	221,403	1,634,491
Total OSS	3,181,110	2,534,672	2,591,685	2,615,617	2,624,235	13,555,749
Combined Equipment	3,249,911	3,231,227	3,510,265	3,739,290	3,959,122	17,717,825
Software	143,528	182,073	141,149	145,802	157,078	772,630
Personnel	6,106,730	6,249,124	6,367,779	6,409,892	6,434,227	31,617,752
Operating	1,588,536	745,525	857,835	931,487	1,011,967	5,125,350
Total Combined Alternative I	11,088,705	10,457,959	10,865,028	11,226,471	11,622,474	55,293,857

* Social Services operational cost estimates include \$650,000 for fiscal agent (Blue Cross and Blue Shield) for fiscal year 1978-79.

TABLE 2
ALTERNATIVE TWO COSTS FOR FY 78-79 THROUGH FY 82-83
-- (in thousands of dollars - 000)

DESCRIPTION	FY 78-79	FY 79-80	FY 80-81	FY 81-82	FY 82-83	TOTAL
General Government and Financial Base*	10,401	9,865	10,286	10,977	11,053	52,582
Software Adjustments	56	(46)	9	16	25	60
Phased Program Migr.	70	100	70	70	70	380
Current Contract Commitment	190	61	-0-	-0-	-0-	251
Operating Adjustments	(4)	(4)	(5)	(5)	(5)	(23)
One Time Cost **	292	-0-	-0-	-0-	-0-	292
Peripheral Equipment	(167)	(196)	(181)	(201)	(222)	(967)
Total Adjustments	437	(85)	(107)	(120)	(132)	(7)
Net Alternative Two Total	10,838	9,780	10,179	10,857	10,921	52,575

* BASE -- Alternative One costs adjusted for elimination of redundant CPU and personnel costs
 ** Facility cost used is the most costly of alternatives in Exhibit D.

TABLE 3
ALTERNATIVE THREE COSTS FOR FY 78-79 THROUGH FY 82-83
(in thousands of dollars - 000)

DESCRIPTION	FY 78-79	FY 79-80	FY 80-81	FY 81-82	FY 82-83	TOTAL
Combined Base*	10,217	9,678	10,000	10,786	10,860	51,539
Software Costs	(29)	(35)	(46)	(33)	(41)	(215)
Contract Commitment	232	77				309
Program Migra. Costs	70	100	70	70	70	380
Operating Costs	(8)	(9)	(9)	(10)	(10)	(46)
Alternative Power Source	180	-0-	-0-	-0-	-0-	180
One Time Cost	518	-0-	-0-	-0-	-0-	518
Peripheral Equipment Cost Adjustment	(239)	(268)	(398)	(428)	(446)	(1779)
Total Adjustments	724	(186)	(383)	(401)	(427)	(673)
Net Alternative Three Adjustments	10,941	9,492	9,715	10,385	10,433	50,966

* BASE -- Alternative One costs adjusted for elimination of redundant CPU and personnel costs.

** Facility cost used is the most costly of alternatives in Exhibit D.

1978

STATE OF
COLORADO

ADP

MASTER PLAN

TABLE 4
COMPARISON OF TOTAL COSTS FOR FY 78-79 THROUGH FY 82-83
(in thousands of dollars - 000)

DESCRIPTION	FY 78-79	FY 79-80	FY 80-81	FY 81-82	FY 82-83	TOTAL
Alternative One	11,089	10,468	10,885	11,229	11,622	55,293
Alternative Two	10,838	9,780	10,179	10,857	10,921	52,575
Alternative Three	10,941	9,492	9,715	10,385	10,433	50,966

Difference Alt. Two - Alt. One	(251)	(688)	(706)	(372)	(701)	(2,718)
Difference Alt. Three - Alt. One	(148)	(976)	(1170)	(844)	(1189)	(4,327)
Difference Alt. Three - Alt. Two	103	(288)	(464)	(472)	(488)	(1,609)

10/1/72

UNITED STATES DEPARTMENT OF AGRICULTURE
WASHINGTON, D.C. 20250

10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72
10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72
10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72
10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72

10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72
10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72
10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72
10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72	10/1/72

10/1/72 10/1/72 10/1/72 10/1/72 10/1/72 10/1/72 10/1/72

SERVICE LEVEL REQUIREMENTS

The three existing computer centers have established service level standards to provide: performance measurements and guidelines for developing cost/benefits analysis for new applications; in determining impact on existing resources; and/or determining new hardware requirements.

The following table depicts the desired service level standards for each type of service provided and the current performance measurements in meeting these standards.

EXHIBIT D

EXHIBIT D

SERVICE LEVEL REQUIREMENTS

The three existing centers have established service level standards to provide performance measurements and objectives for the future. The following table provides a summary of the current performance level and the service provided and the current performance level.

REQUIREMENTS	STANDARD	CURRENT % OF ATTAINMENT		
		DIVISION OF ADP	REVENUE	SOCIAL SERVICES
<ul style="list-style-type: none"> • Prime Shift - 8:00 AM to 5:00 PM 				
On-line (interactive) applications where full time operators are employed whose high productivity would be lost by poor response time.	less than 5 seconds 99% of the time	35%	90%	81%
On-line inquiry applications where citizens information is being retrieved for agency and/or citizen inquiry and inter-active program development.	less than 10 seconds 95% of the time	76%	67%	91%
Computer to computer communication for operational information	less than 10 seconds 99% of the time	N/A	10%	N/A
Computer to computer communication for management information	less than 2 minutes 95% of the time	N/A	N/A	N/A
On-line inquiry applications for management information	less than 20 seconds 95% of the time	91%	N/A	96%
Remote and local batch production jobs that require prime shift processing	less than 1 hour 75% of the time	68%	70%	72%
<ul style="list-style-type: none"> • less than 1 hour • 1 to 2 hours 	less than 2 hours 100% of the time	89%	98%	95%

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COLORADO

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1978

EXHIBIT D

REQUIREMENTS	STANDARD	CURRENT % OF ATTAINMENT		
		DIVISION OF ADP	REVENUE	SOCIAL SERVICES
<ul style="list-style-type: none"> • <u>Prime Shift con't:</u> 				
Inquiry by counselors, auditors, etc. for conduct of daily business.	less than 1 minute 95% of the time	N/A	N/A	N/A
Remote and local batch program compiles and test:				
<ul style="list-style-type: none"> • less than 1 hour • 1 to 2 hours • 2 of 4 hours • 4 to 6 hours • 6 to 14 hours 	75% 95% 98% 99% 100%	62% 77% 85% 89% 95%	68% 87% 95% 99% 99%	95% 99%
Remote and local student batch jobs:				
<ul style="list-style-type: none"> • less than 1 hours • 1 to 2 hours • 2 to 6 hours • 6 to 14 hours 	90% 98% 99% 100%	81% 90% 96% 99%	N/A	N/A
<ul style="list-style-type: none"> • <u>Second and Third Shifts</u> 				
All on-line (inter-active) processing	same as prime shift	N/A	N/A	N/A
Remote and local batch production jobs.	overnight (up to 14 hours) 99%	83%	85%	95%



COMPUTER OPERATIONS PERSONNEL REQUIREMENTS

The following tables are provided to reflect the personnel required to operate the computer centers for the three selected alternatives. Table-4, Alternative One, represents a summarization of the personnel requirements projected by each Department to continue the three existing computer centers (Table 1 thru 3).

Table 5, Alternative Two, depicts the personnel required to operate two computer centers and Table-6, Alternative Three, reflects the personnel requirements to operate one computer center.

In developing the requirements for operator personnel on Tables 5 and 6, the following computations were used, based upon computer facility operations of 24 hours a day, seven days a week, 52 weeks a year.

Shifts per year	
52	weeks per year
x 21	number of shifts per week
<u>1092</u>	

Available shifts per FTE

52	weeks per year
x 5	shifts per week
<u>260</u>	shifts per year per FTE
-15	shifts for vacation
-12	shifts for holiday
- 8	shifts for sick
<u>225</u>	estimated shift coverage per FTE per year

FTE Requirements

$$\frac{1092}{225} = 4.85 \text{ FTE to cover all shifts per year with one operator}$$

Alternative II need is 5 operators per shift = $5 \times 4.85 = 24$ FTE

Alternative III need is 6 operators per shift = $6 \times 4.85 = 29$ FTE

Table-7 represents the personnel cost factors used in Chapter III, "Alternatives Considered."

The following annual costs were used in determining the projected personnel savings for Alternatives Two and Three in Table-7.

<u>DESCRIPTION</u>	<u>ANNUAL COST</u>
Operations Manager	\$27,000
Operations Supervisor	\$22,000
Computer Shift Supervisor	\$15,000
Computer Operator	\$12,000
Schedulers	\$18,000
Data Control Supervisors	\$11,000
Data Control	\$ 8,000
Software Specialist	\$24,000
Secretary/Typist	\$ 7,000
Storekeeper	\$ 8,000
Operations Manager Assistant	\$23,000

ALTERNATIVE ONE
COMPUTER OPERATIONS
PERSONNEL REQUIREMENTS

TABLE - 1

DEPARTMENT OF ADMINISTRATION, DIVISION OF ADP

JOB CLASSIFICATIONS	77-78 FTE	78-79 FTE	79-80 FTE	80-81 FTE	81-82 FTE	82-83 FTE
Operations Manager	1	1	1	1	1	1
Operations Supervisor	1	1	1	1	1	1
Computer Shift Supervisor	4	3	3	3	3	3
Operator	12	12	13	16	17	18
Scheduler	2	2	2	2	2	2
Magnetic Tape Libr. Supv.						
Mag. Tape Librarian						
Data Control Supervisor	1	1	1	1	1	1
Data Control	4	4	5	6	6	7
Secretary	2	2	2	2	2	2
Storekeeper	1	1	1	1	1	1
Software Specialist	4	4	4	4	4	4
System Programming Manager	1	1	1	1	1	1
Messenger	2	2	2	2	2	2
TOTAL PERSONNEL	35	34	36	40	41	43

ALTERNATIVE ONE
COMPUTER OPERATIONS
PERSONNEL REQUIREMENTS

TABLE - 2

DEPARTMENT OF REVENUE

JOB CLASSIFICATIONS	77-78 FTE	78-79 FTE	79-80 FTE	80-81 FTE	81-82 FTE	82-83 FTE
Operations Manager	1	1	1	1	1	1
Operations Supervisor	1	1	1	1	1	1
Computer Shift Supervisor	3	3	3	3	3	3
Operator	20	20	20	20	20	20
Scheduler	1	1	1	1	1	1
Magnetic Tape Libr. Supv.	1	1	1	1	1	1
Mag. Tape Librarian	2	2	2	2	2	2
Data Control Supervisor	1	1	1	1	1	1
Data Control Clerk	7	7	8	8	9	9
Secretary	1	1	1	1	1	1
Storekeeper	1	1	1	1	1	1
Software Specialist	1	1	1	2	2	2
TOTAL PERSONNEL	40	40	41	42	43	43

ALTERNATIVE ONE
COMPUTER OPERATIONS
PERSONNEL REQUIREMENTS

TABLE - 3

DEPARTMENT OF SOCIAL SERVICES

JOB CLASSIFICATIONS	77-78 FTE	78-79 FTE	79-80 FTE	80-81 FTE	81-82 FTE	82-83 FTE
Operations Manager	1	1	1	1	1	1
Operations Supervisor	2	2	2	2	2	2
Computer Shift Supervisor	1	1	1	1	1	1
Operator	8	10(1)	10(1)	10(1)	10(1)	10(1)
Scheduler	1	1(.5)	1(1)	1(1)	1(1)	1(1)
Magnetic Tape Libr. Supv.	0	0	0	0	0	0
Mag. Tape Librarian	0	0	0	0	0	0
Data Control Supervisor	0	0	0	0	0	0
Data Control	4	4(2.0)	4(4)	4(4)	4(4)	4(4)
Secretary	1	1	1	1	1	1
Storekeeper	1	1	1	1	1	1
Software Specialist	2	2(1)	2(2)	2(2)	2(2)	2(2)
TOTAL PERSONNEL	21	23(4.5)	23(8)	23(8)	23(8)	23(8)

(x) Not requested - to be required via MMSI or MRE

ALTERNATIVE ONE
COMPUTER OPERATIONS
PERSONNEL REQUIREMENTS

TABLE - 4

CONTINUE THE THREE EXISTING COMPUTER CENTERS

JOB CLASSIFICATIONS	77-78 FTE	78-79 FTE	79-80 FTE	80-81 FTE	81-82 FTE	82-83 FTE
Operations Manager	3	3	3	3	3	3
Operations Supervisor	4	4	4	4	4	4
Computer Shift Supervisor	8	7	7	7	7	7
Operator	40	42	43	46	47	48
Scheduler	4	4	4	4	4	4
Magnetic Tape Libr. Supv.	1	1	1	1	1	1
Mag. Tape Librarian	2	2	2	2	2	2
Data Control Supervisor	2	2	2	2	2	2
Data Control	15	15	17	18	19	20
Secretary and Typist	4	4	4	4	4	4
Storekeeper	3	3	3	3	3	3
Software Specialist	7	7	7	8	8	8
Software Specialist Manager	1	1	1	1	1	1
Messenger	2	2	2	2	2	2
TOTAL PERSONNEL	96	97	100	105	107	109

ALTERNATIVE TWO
COMPUTER OPERATIONS
PERSONNEL REQUIREMENTS

TABLE - 5

(OPERATE TWO COMPUTER CENTERS)

JOB CLASSIFICATIONS	77-78 FTE	78-79 FTE	79-80 FTE	80-81 FTE	81-82 FTE	82-83 FTE
Operations Manager	2	2	2	2	2	2
Operations Supervisor	2	2	2	2	2	2
Computer Shift Supervisor	6	6	6	6	6	6
Operator	29	29	29	29	29	29
Scheduler	2	2	2	2	2	2
Magnetic Tape Libr. Supv.	1	1	1	1	1	1
Mag. Tape Librarian	2	2	2	2	2	2
Data Control Supervisor	2	2	2	2	2	2
Data Control	11	11	13	13	14	15
Secretary	2	2	2	2	2	2
Storekeeper	2	2	2	2	2	2
Software Specialist	4	4	4	4	4	4
System Programming Manager	1	1	1	1	1	1
Messenger	2	2	2	2	2	2
TOTAL PERSONNEL	68	68	70	70	71	72

ALTERNATIVE THREE
COMPUTER OPERATIONS
PERSONNEL REQUIREMENTS

TABLE - 6

OPERATE ONE COMPUTER CENTER

JOB CLASSIFICATIONS	77-78 FTE	78-79 FTE	79-80 FTE	80-81 FTE	81-82 FTE	82-83 FTE
Operations Manager	1	1	1	1	1	1
Operations Supervisor	1	1	1	1	1	1
Computer Shift Supervisor	4	4	4	4	4	4
Operator	24	24	24	24	24	24
Scheduler	2	2	2	2	2	2
Magnetic Tape Libr. Supv.	1	1	1	1	1	1
Mag. Tape Librarian	2	2	2	2	2	2
Data Control Supervisor	1	1	1	1	1	1
Data Control	10	10	12	12	13	14
Secretary	1	1	1	1	1	1
Storekeeper	2	2	2	2	2	2
Software Specialist	3	3	3	3	3	3
Assistant Manager	1	1	1	1	1	1
Systems Programming Manager	1	1	1	1	1	1
Messenger	2	2	2	2	2	2
TOTAL PERSONNEL	56	56	58	58	59	60

DIVISION OR OFFICE: Field Operations

DATE: January 25, 1978

SUBJECT:

MOVEMENT OF SOCIAL SERVICES SUPERVISOR I
TO SOCIAL SERVICES SUPERVISOR II
(Supersedes all previous instructions)

AGENCY DIRECTOR REVIEW

EXECUTIVE Administrator Approval

EXPIRATION DATE: Upon Receipt

Social Services Supervisors I who were appointed on or after March 1, 1977 will be required to pass a written and an oral examination prior to promotion to the class of Social Services Supervisor II. Failure to pass either portion of the examination will result in a voluntary demotion of the employee to the former class of position in accordance with section 2.114.55-C (1), Volume II or the termination of the employee who does not have status in the Merit System.

By the beginning of the 10th month of employment as a Social Services Supervisor I, the county department shall submit a Per-MS-7 and a completed "satisfactory" Service Rating for the employee, to the Merit System Supervisor. Upon receipt of these documents, the employee will be scheduled for testing. The Merit System Technical Services Unit will notify the employee and the county department of the time, date, and place of test.

If the employee is to retain status in the Merit System and the county department is to receive reimbursement after the probationary period has ended, it is the responsibility of the county department to submit the required forms in accordance with the schedule stated in the preceding paragraph. It will be the responsibility of the Merit System Services Unit to test the employee prior to the end of the 12th month of employment. No employee will be allowed to retake the Social Services Supervisor II examination after a failure.

COUNTY DEPARTMENTS MUST SUBMIT REQUIRED DOCUMENTS FOR EMPLOYEES WHO WERE APPOINTED IN MARCH AND APRIL 1977 - IMMEDIATELY.

A Social Services Supervisor I, with Merit System status, who fails the examination for promotion to Social Services Supervisor II and is demoted, may, after 12 months from the date of the failure, submit a DPR (Departmental Promotional Rating) for promotion back to Social Services Supervisor I class.

A Social Services Supervisor I, who does not have permanent status in the Merit System and who fails the examination for promotion to Social Services Supervisor II, may apply for examination to Social Services Supervisor I, twelve months from date of failure, by submitting an application to the Merit System Examiner.

++++++

Social Services Supervisors I, who were in the system prior to March 1, 1977, should have been tested by this time if they wished to promote:

- (1) Those who passed the test, if not already promoted, shall be promoted to Social Services Supervisor II with an effective date no later than March 1, 1978.
- (2) Those who failed the test may retake it in accordance with section 2.112.21 (e) of Volume II. The effective date of promotion for these employees shall be the date the test is passed.



COMPUTER OPERATIONS
PERSONNEL REQUIREMENTS
(COST FACTOR)

TABLE-7

ALTERNATIVE TWO:

DESCRIPTION	DOLLAR SAVINGS BY FY				
	78-79	79-80	80-81	81-82	82-83
Operations Manager	27,000	27,000	27,000	27,000	27,000
Operations Supervisor	44,000	44,000	44,000	44,000	44,000
Computer Shift Supervisor	30,000	30,000	30,000	30,000	30,000
Operator	156,000	168,000	204,000	216,000	228,000
Scheduler	36,000	36,000	36,000	36,000	36,000
Data Control	32,000	32,000	40,000	40,000	40,000
Secretary/Typist	14,000	14,000	14,000	14,000	14,000
Storekeeper	8,000	8,000	8,000	8,000	8,000
Software Specialist	72,000	72,000	96,000	96,000	96,000
TOTAL SAVINGS	419,000	431,000	499,000	511,000	523,000

ALTERNATIVE THREE:

DESCRIPTION	DOLLAR SAVINGS BY FY				
	78-79	79-80	80-81	81-82	82-83
Operations Manager	54,000	54,000	54,000	54,000	54,000
Operations Supervisor	66,000	66,000	66,000	66,000	66,000
Computer Shift Supervisor	60,000	60,000	60,000	60,000	60,000
Operator	216,000	228,000	264,000	276,000	288,000
Scheduler	36,000	36,000	36,000	36,000	36,000
Data Control Supervisor	11,000	11,000	11,000	11,000	11,000
Data Control	40,000	40,000	48,000	48,000	48,000
Secretary/Typist	21,000	21,000	21,000	21,000	21,000
Storekeeper	8,000	8,000	8,000	8,000	8,000
Software Specialist	96,000	96,000	120,000	120,000	120,000
Operations Manager Assis.	(23,000)	(23,000)	(23,000)	(23,000)	(23,000)
TOTAL SAVINGS	585,000	597,000	665,000	677,000	689,000



Physical Site Considerations

Each of the existing three locations (DADP, DOR and DSS) currently have secure, air conditioned, raised floor computer installations. They are located in the basement of 2004 S. Colorado Blvd., the basement of 14th and Sherman (Capitol Annex) and the first floor of 16th and Sherman (Social Services Bldg). The current facilities have varying degrees of ancillary work and storage space. Currently, each site is adequate for existing requirements.

Table I, below, shows the additional requirements for security, raised floor space, air conditioning including chillers (if needed) and electrical power including a backup generator (if needed) depending upon which alternative is selected. For several items of cost, the task force did not estimate because of their unknown nature. Displacement of staff through computer facility expansion is an example of this. Once site selection is made these costs can be reasonably estimated and should be included in the total cost. Additionally, under Alternative Three there is a need for 4,600 square feet of storage which has not been estimated. This cost also needs to be added after the site is selected. Moving costs of computer equipment was estimated and included in the first year adjustment costs, it is not shown in table I.

The task force made several assumptions. One assumption is relative to backup electrical power. Currently none of the facilities has a back-up power generator. It was assumed that this need only existed when operating under Alternative Three when all processing takes place at one location. Based upon prior state site preparation costs \$42 per square foot was used for any additional raised flooring; \$1,200 per ton for additional air conditioning; \$35,000 was used for installation of chillers; and 3600 square feet was selected as optimum for Alternative Two and 5500 square feet was used for Alternative Three.

PHYSICAL SITE CONSIDERATIONS

ESTIMATED SITE PREPARATION COSTS
(in thousands of dollars)

TABLE 1

DESCRIPTION	DADP			DOR			DSS		
	ALTERNATIVE			ALTERNATIVE			ALTERNATIVE		
	1	2	3	1	2	3	1	2	3
SECURITY	0	15.0	30.0	0	15.0	30.0	0	15.0	30.0
SPACE	0	42.0	138.6	0	42.0	159.6	46.2	75.6	172.2
AIR CONDITIONING	0	0	0	0	12.0	24.0	18.5	12.0	33.0
CHILLERS	0	35.0	35.0	0	35.0	35.0	0	35.0	35.0
ELECTRICAL POWER	0	15.0	15.0	0	15.0	15.0	15.0	15.0	15.0
UNINTERRUPTABLE POWER SUPPLY	0	0	180.0	0	0	180.0	0	0	180.0
TOTAL	0	107.0	398.6	0	119.0	443.6	79.7	152.6	465.2

Although the pure economics indicate DADP is the least costly for Alternative Three, other factors such as proximity to users, displacement of function, forms storage and governance should be considered in making a decision as all locations are capable of accommodating the ultimate site. DADP and DOR would seem to be the most economical locations for Alternative Two.

COMPUTER UTILIZATION AND COSTING

The chart exhibits on the following pages were developed from industry publications and were used within this document to determine the size of computers necessary to handle the projected workload developed by the Task Force.

On Exhibit E-2, the IBM 370/145 is used as a base (given a value of 1:1 relative power). The down time/maintenance figures are based upon the actual historical averages of the existing facilities and was determined to be the best figures for the proposed new equipment. Also on Exhibit E-2, it was determined that only 85% of any computers relative power can be achieved without degradation to the actual work being performed. This determination was made by examining the performance of existing processors when the actual processing unit exceeds 85%. The industry standard bears out that major vendors use 80% as the point of maximum utilization.

On Exhibit E-3, the central processor unit hours are again adjusted to reflect the additional overhead created by coupling two processors to share common peripherals. Based upon the results of a hardware monitor analysis of the two coupled 145 processors at the Division of ADP, with the 145 single processors at Social Services, and Colorado University, it was determined that an approximate 10% degradation occurs. The problem program state calculation is based on the average estimated ratio of supervisor/problem program within the existing facilities. The projection of this ratio is based upon the vendors estimates for the newly announced processors.

Exhibit E-4 portrays the projected relative power capability of equipment for various levels of problem program state requirements and provides a method for classing computers.

Computers were classed based upon their individual relative power capacity and, when coupled with a second processor, the combined relative power capacity. The purpose of classing the various processors and combination of coupled processors was to provide an easy reference for comparison of relative power and cost considerations of the combinations. Class I processors are the smallest ones considered in this study and include those processors that provide up to 9,853 hours per year of problem program state relative power. Class II processors would provide up to 18,800 hours per year of problem program state relative power. Classes III, IV, V, and VI, would provide problem program state relative power of up to 27,500 hours, 36,300 hours, 45,300 hours and 54,000 hours respectively.

Exhibits E-5, 6 and 7 portray the application of the projected workloads of the three alternatives to the class levels developed on Exhibit E-4.

CONFIGURATION COMPARISONS
FOR
SINGLE CENTRAL PROCESSORS

MACHINE	COST	RELATIVE POWER	TOTAL AVAILABLE HOURS PER YEAR	AVAILABLE HOURS AT 85%
135	144,804	.5:1	4,261	3,623
135III	258,000	.65:1	5,540	4,709
145	278,196	1:1 (BASE)	8,523*	7,245
145III	298,392	1.35:1	11,506	9,780
148	279,600	1.35:1	11,506	9,780
158	487,968	2.3:1	19,603	16,663
3031	330,000	3.2:1	27,274	23,184
168	948,000	6.35:1	54,121	46,005
3032	616,320	7.2:1	61,365	52,164
3033	844,800	12.25:1	104,406	88,751

	HOURS
24 hours X 365 days	8,760
Less: Down time/Maintenance	237
BASE	8,523*

Total available hours per year is computed by multiplying the base hours of 8,523 by the relative power for each machine.

Available hours at 85% is computed by multiplying the total available hours per year by 85% or .85.

CONFIGURATION COMPARISONS
FOR
COUPLED CENTRAL PROCESSORS

PROCESSORS	CPU HRS PER YEAR AT 85%	CPU HRS PER YEAR COUPLED @ 90% EFFICIENCY	PROBLEM PROGRAM STATE @ 50%	CLASS
135/145	10,868	9,781	4,891	I
135III/145	11,954	10,759	5,380	I
135/145III	13,493	12,063	6,032	I
135III/145III	14,489	13,040	6,520	I
145/145	14,490	13,040	6,520	I
145/143	17,025	15,323	7,662	I
145III/148	19,560	17,604	8,802	I
158	16,663	-	8,332	I
158/145	23,908	21,517	10,759	II
158/148	26,443	23,799	11,900	II
158/158	33,326	29,993	14,997	II
3031	23,184	-	11,592	II
3031/145	30,429	27,386	13,693	II
3031/148	32,964	29,668	14,834	II
3031/158	39,847	35,862	17,931	II
3032	52,164	-	26,082	III
3032/145	59,409	53,468	26,734	III
3032/148	61,944	55,750	27,875	IV
3032/158	68,827	61,944	30,972	IV
3031/3031	46,368	41,731	20,866	III
3032/3031	75,348	67,813	33,907	IV
3032/3032	104,328	93,895	46,948	VI
3033	88,751	-	44,376	VII

Central Processor Unit (CPU) hours coupled at 90% is computed by multiplying the CPU hours for coupled machines at 85% by 90% or .90.

Problem program state is computed by multiplying the CPU hours coupled at 90% (or CPU hours at 85% if single processor) by 50% or .50.

BASED ON 85% AVAILABILITY
OF PROCESSING POWER AND TURNING
IN PROBLEM PROGRAM STATE 60%

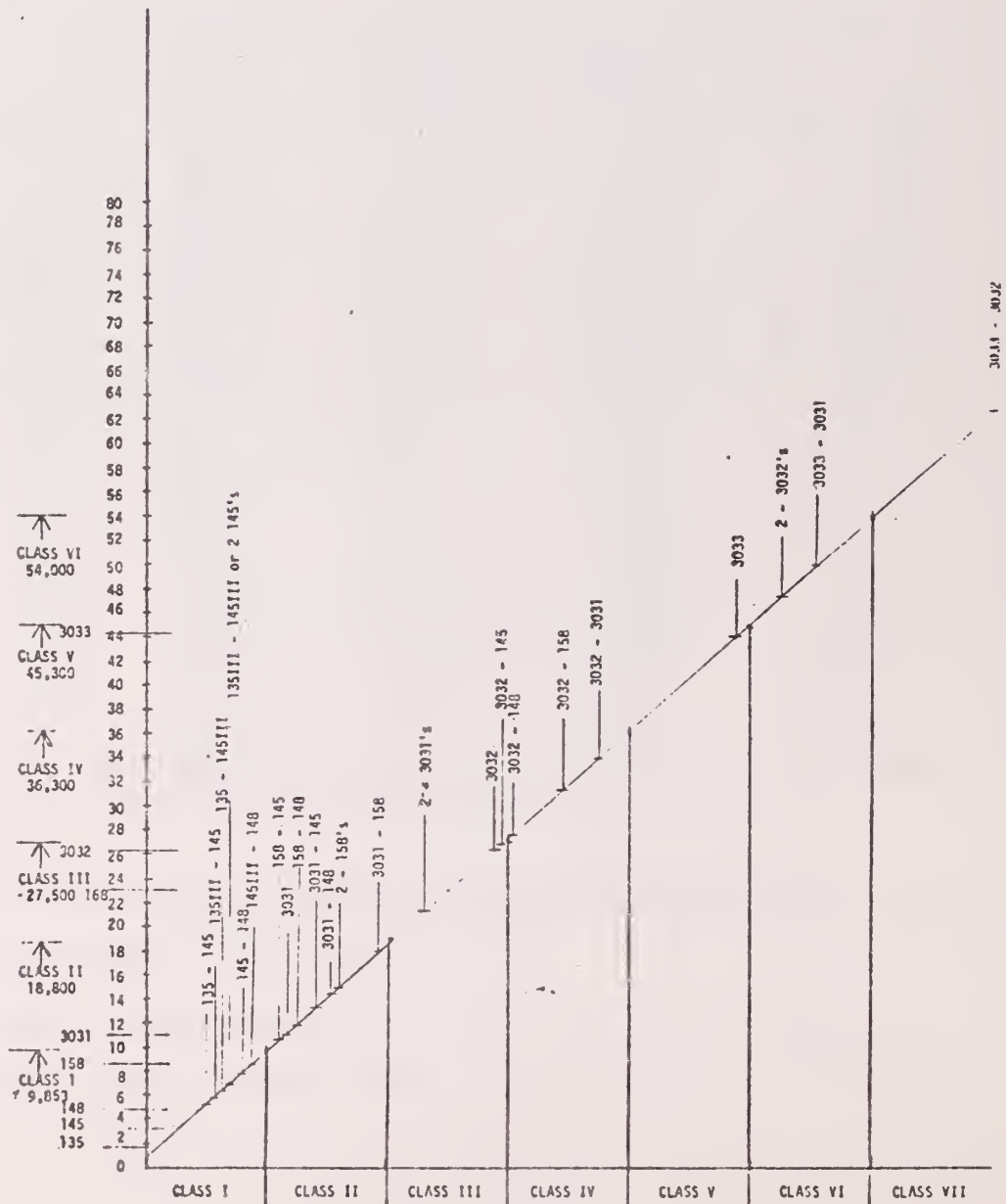
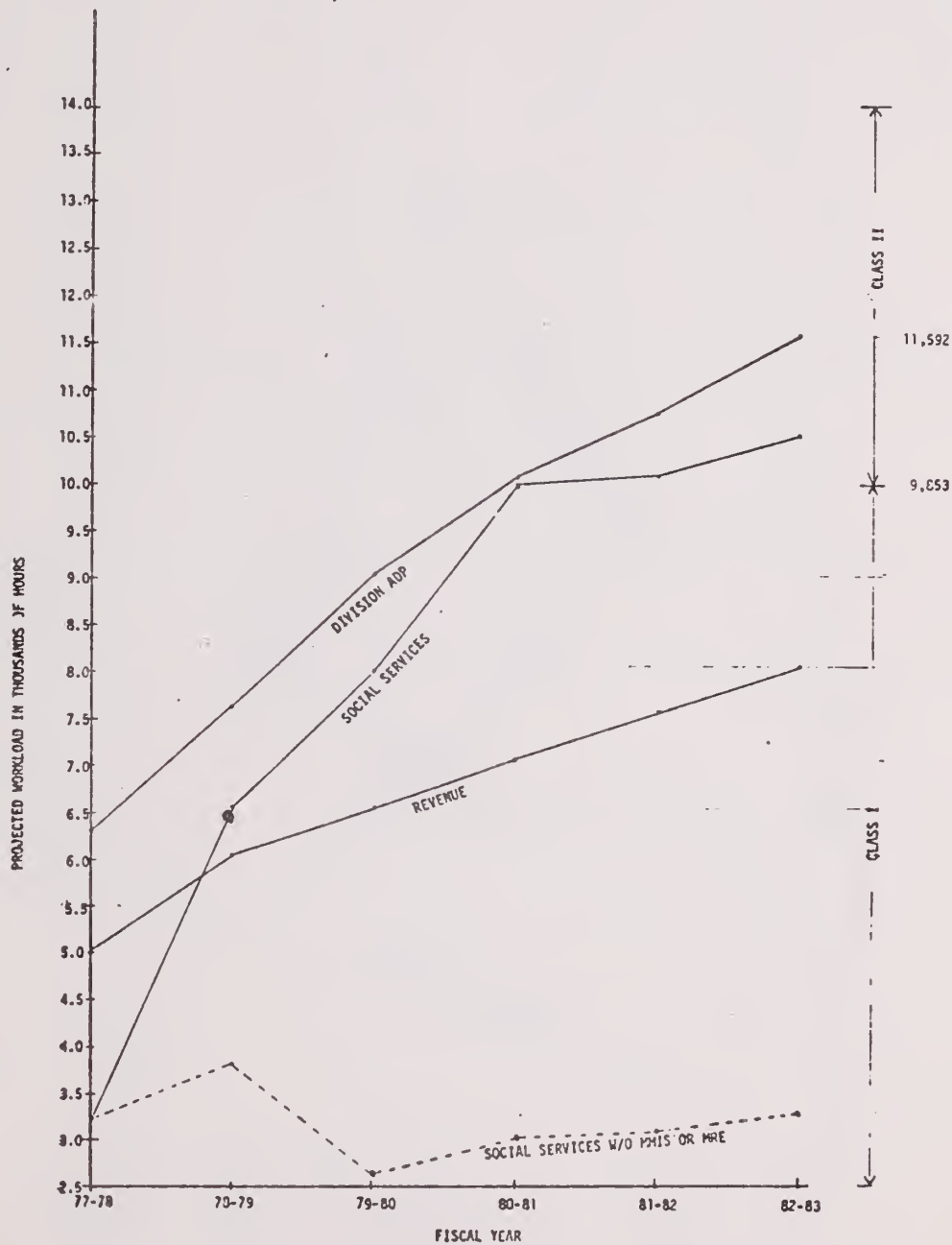


EXHIBIT G

PROJECTED WORKLOADS FOR ALTERNATIVE I
 FOR FISCAL YEARS 1977-78 THRU 1982-83
 FOR: DEPARTMENT OF SOCIAL SERVICES
 DEPARTMENT OF REVENUE
 DIVISION OF ADP

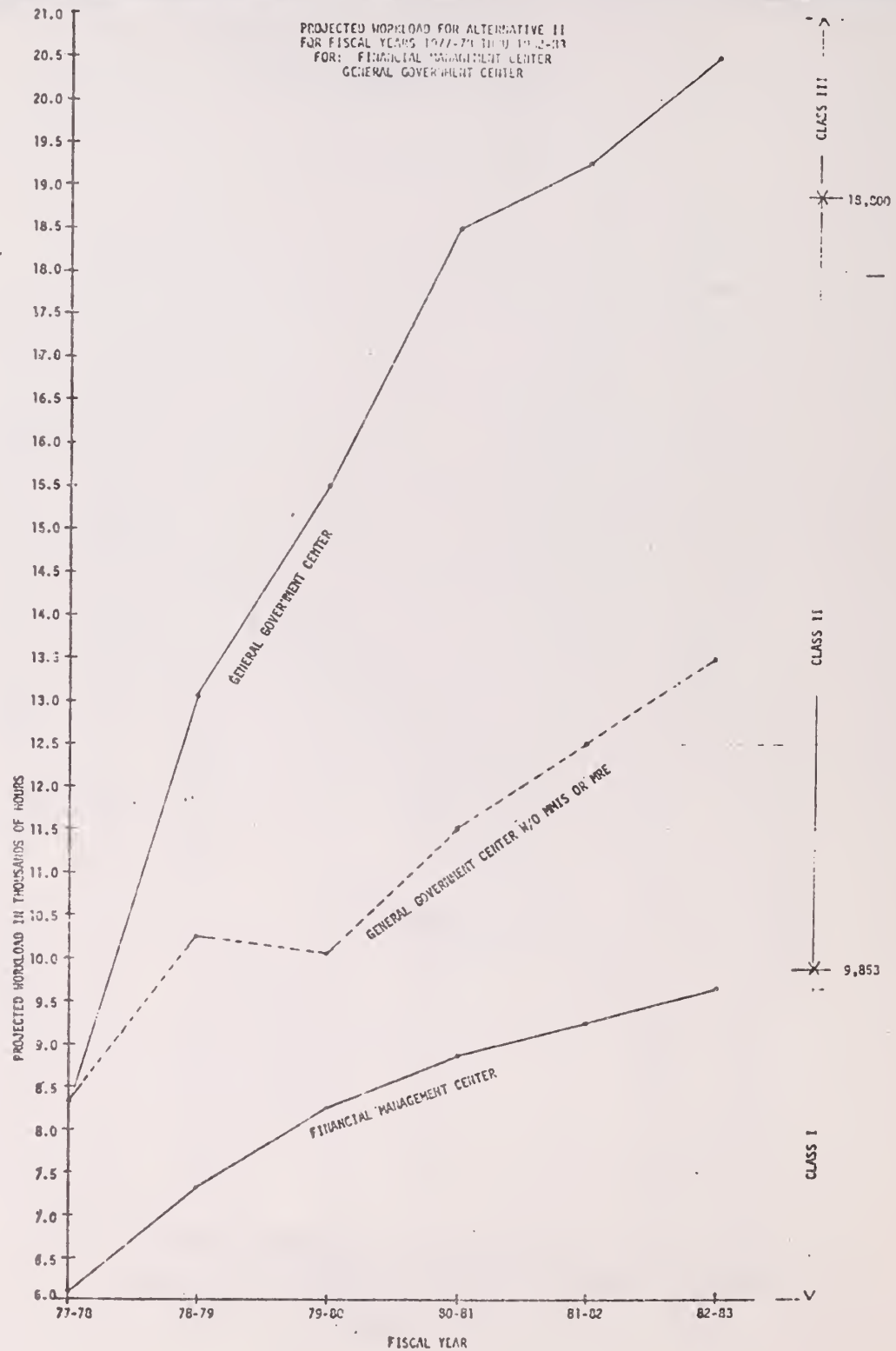


1978

STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT G



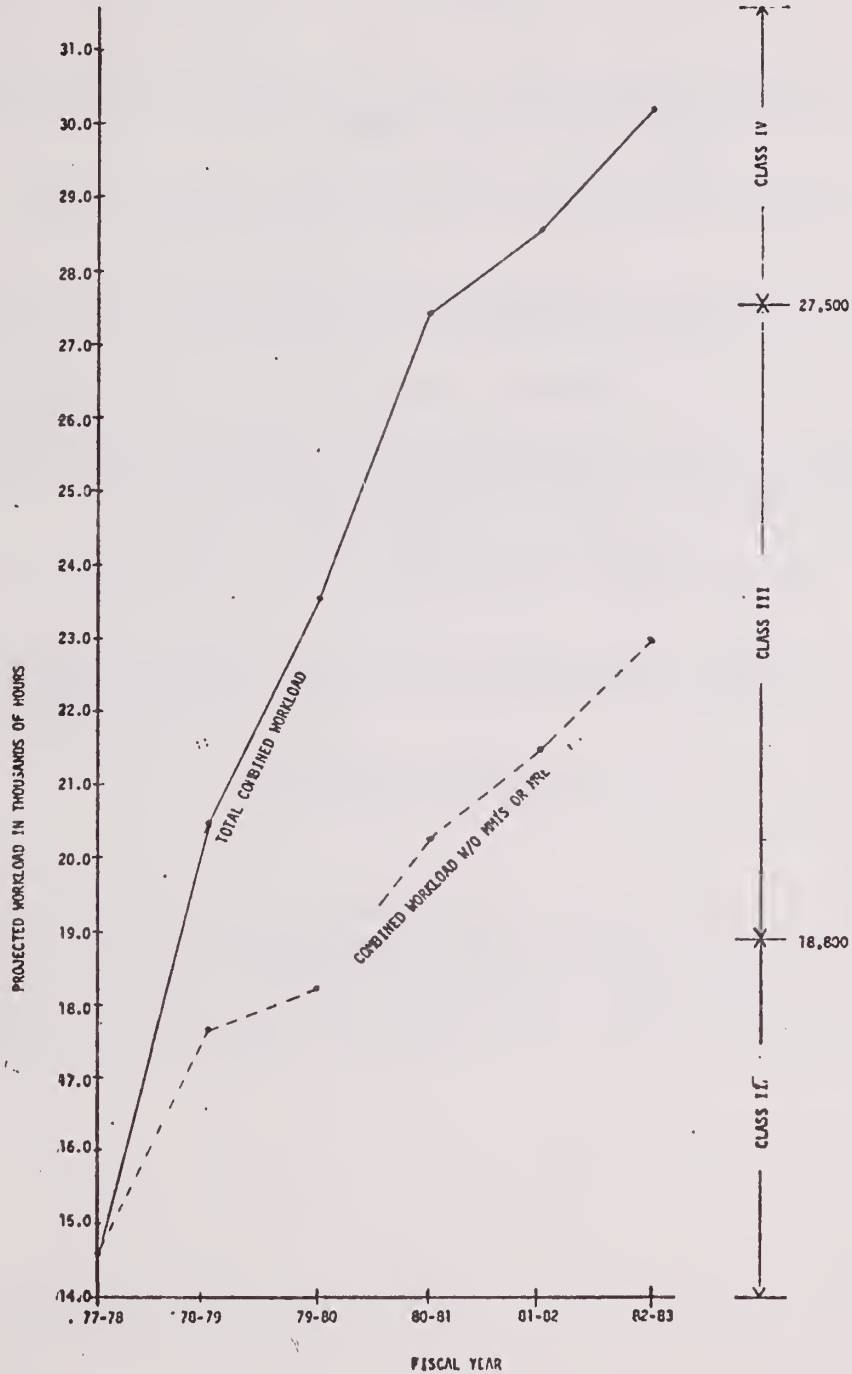
1978

STATE OF
COLORADO

ADP MASTER PLAN

EXHIBIT G

PROJECTED WORKLOAD FOR ALTERNATIVE III
FOR FISCAL YEARS 1977-78 THRU 1982-83
FOR A SINGLE FACILITY



1978

STATE OF
COLORADO

ADP MASTER PLAN

ECONOMIC ANALYSIS

An economic analysis was made by using a 15% factor for a cost of capital in determining the present worth of both cost and displaced cost elements for the five-year projections from fiscal year 1978-79 through 1982-83.

The Task Force perceived two methods of protecting the State's investment in paid-off equipment:

- 1) Relocation of purchased equipment to another State facility reducing the cost at that location for comparable leased equipment.
- 2) Selling the purchased equipment through the competitive bid process.

The latter method was selected and used in the following calculations. Information pertaining to the residual value of the paid-off equipment was obtained from third party companies specializing in the buying and selling of IBM equipment.

<u>Company Name</u>	<u>Location</u>
Comdisco	Walnut Creek, California
Economic Data Corp.	Denver, Colorado
CMI Corp.	St. Clair Shore, Michigan

(Present worth calculations in thousand (000) of dollars.)

Alternative One (three centers)

For Alternative One the cost factors include all costs required to support the installation of a Class II Processor at all three locations on July 1, 1978. The three facilities will also operate their existing I45 processor during the entire five-year planning period. The displaced cost factor amount included the selling of the Department of Revenue's I35 processor through the competitive bid process.

Calculation:

Present Worth = PW
 Cost = C
 Displaced Cost = I

$$PW = C_1 - I_1 + C_2(P/F, 15, 1) + C_3(P/F, 15, 2) + C_4(P/F, 15, 3) + C_5(P/F, 15, 4)$$

EXHIBIT H

Total Investment:

$C_1 = 11,089$

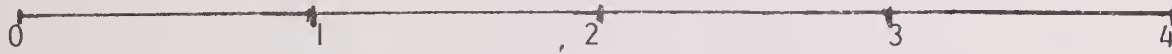
$C_2 = 10,468$

$C_3 = 10,885$

$C_4 = 11,229$

$C_5 = 11,622$

$I_1 = 117$



$$PW = 11,089 - 117 + 10,468(.8696) + 10,885(.7561) + 11,229(.6575) + 11,622(.5718)$$

$$PW = 10,972 + 9,103 + 8,230 + 7,383 + 6,645$$

$$PW \text{ TOTAL INVESTMENT} = \$42,333$$

Incremental Investment:

$C_1 = 11,089 - 9,085$

$C_2 = 10,468 - 9,085$

$C_3 = 10,885 - 9,085$

$C_4 = 11,229 - 9,085$

$C_5 = 11,622 - 9,085$

$I_1 = 117$



$$PW = (2,004 - 117) + 1,383(.8696) + 1,800(.7561) + 2,144(.6575) + 2,537(.5718)$$

$$PW = 1,887 + 1,203 + 1,361 + 1,410 + 1,451$$

$$PW \text{ INCREMENTAL (NEW) INVESTMENT} = \$7,312$$



Alternative Two (two centers)

For Alternative Two the cost factors include all costs required to support the installation of a Class III Processor for the General Government Center and a Class II Processor for the Financial Management Center on July 1, 1978. The Financial Management Center will also continue to operate the 145 currently located at the Department of Revenue. This equipment will operate during the entire five-year planning period. The displaced cost factor amounts include the selling of the owned 135 at the Department of Revenue and the owned 145's currently operating at the Division of ADP and the Department of Social Services.

Calculation:

Present Worth = PW
 Cost = C
 Displaced Cost = I

$$PW = C_1 - I_1 + C_2(P/F, 15, 1) + C_3(P/F, 15, 2) + C_4(P/F, 15, 3) + C_5(P/F, 15, 4)$$

Total Investment:

$$C_1 = 10,838 \quad C_2 = 9,780 \quad C_3 = 10,179 \quad C_4 = 10,857 \quad C_5 = 10,921$$

$$I_1 = 867$$



$$PW = 10,838 - 867 + 9,780(.8696) + 10,179(.7561) + 10,857(.6575) + 10,921(.5718)$$

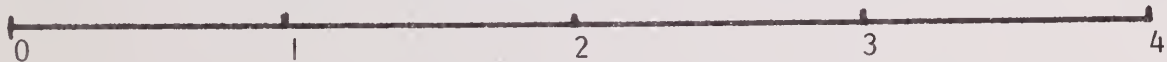
$$PW = 9,971 + 8,505 + 7,696 + 7,138 + 6,245$$

$$PW \text{ TOTAL INVESTMENT} = \$39,555$$

Incremental Investment:

$$C_1 = 10,838 - 9,085 \quad C_2 = 9,780 - 9,085 \quad C_3 = 10,179 - 9,085 \quad C_4 = 10,857 - 9,085 \quad C_5 = 10,921 - 9,085$$

$$I_1 = 867$$



$$PW = (1,753 - 867) + 695(.8696) + 1,094(.7561) + 1,772(.6575) + 1,836(.5718)$$

$$PW = 886 + 604 + 821 + 1,165 + 1,050$$

$$PW \text{ INCREMENTAL (NEW) INVESTMENT} = \$4,526$$



Alternative Three (one center)

For Alternative Three the cost factors include all costs required to support the installation of a Class II and a Class III Processor at one site on July 1, 1978 and replace all existing processors at the Departments of Revenue and Social Services and the Division of ADP. The displaced cost factor amounts include the selling of the State-owned equipment.

Calculation:

Present Worth = PW
 Cost = C
 Displaced Cost = I

$$PW = C_1 - I_1 + C_2(P/F, 15, 1) + C_3(P/F, 15, 2) + C_4(P/F, 15, 3) + C_5(P/F, 15, 4)$$

Total Investment:

$C_1 = 10,941$ $C_2 = 9,492$ $C_3 = 9,715$ $C_4 = 10,385$ $C_5 = 10,433$
 $I_1 = 1,097$



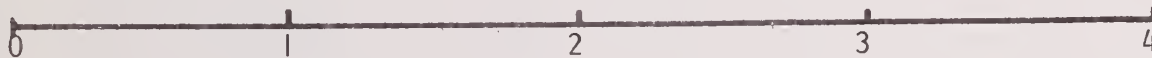
$$PW = 10,941 - 1,097 + 9,492(.8696) + 9,715(.7561) + 10,385(.6575) + 10,433(.5718)$$

$$PW = 9,844 + 8,254 + 7,346 + 6,828 + 5,965$$

$$PW \text{ TOTAL INVESTMENT} = \$38,237$$

Incremental Investment:

$C_1 = 10,941 - 9,085$ $C_2 = 9,492 - 9,085$ $C_3 = 9,715 - 9,085$ $C_4 = 10,385 - 9,085$ $C_5 = 10,433 - 9,085$
 $I_1 = 1,097$



$$PW = (1,856 - 1,097) + 407(.8696) + 630(.7561) + 1,300(.6575) + 1,348(.5718)$$

$$PW = 759 + 354 + 476 + 855 + 771$$

$$PW \text{ TOTAL INVESTMENT} = \$3,215$$



FINANCIAL ANALYSIS

The following financial analysis is provided to assist in the decision making process for determining where to lease, lease/purchase, or outright purchase the Central Processor Units (PCU) for the selected Alternative. The cost information reflected in the calculations, below, was obtained from the current hardware vendor and a third party leasing company.

1. Outright Purchase in Thousands (000)

Present Worth = PW
 Purchase Price = C
 Maintenance Cost = MC
 Salvage Value = L

C = 3,142

MC = 119

MC = 119

MC = 119

MC = 119

L = 1,122



$$PW = (C + MC) + MC(P/A, 15, 4) - L(P/F, 15, 4)$$

$$PW = (3,142 + 119) + 119(2.855) - 1,122(.5718)$$

$$PW = 3,261 + 340 - 642$$

$$PW \text{ OUTRIGHT PURCHASE} = \$2,959$$

2. Installment Purchase in Thousands (000)

a. With Exercise of Purchase Option at end of 5 years

Present Worth = PW
 Annual Installment = C
 Final Installment = FC
 Maintenance Cost = MC
 Salvage Value = L

C = 562
MC = 119C = 562
MC = 119C = 562
MC = 119C = 562
MC = 119L = 1,122
FC = 1,204
MC = 119



$$PW = (C+OC)+C+OC(P/A, 15, 3)+FC+MC(P/F, 15, 4)-L(P/F, 15, 4)$$

$$PW = (562+119)+562+119(2.283)+1,204+119(.5718)-1,122(.5718)$$

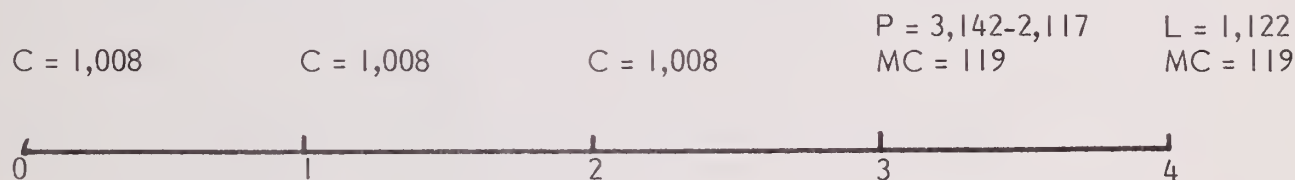
$$PW = 681+1,555+756-642$$

$$PW \text{ INSTALLMENT PURCHASE} = \$2,350$$

3. Lease (State and Local Government) in Thousands (000)

a. Lease with Purchase Option

Present Worth	=	PW
Annual Lease	=	C
Purchase Price		
Less Accruals	=	P
Maintenance Cost	=	MC
Salvage Value	=	L



$$PW = C+C(P/A, 15, 2)+P+MC(P/F, 15, 3)+MC(P/F, 15, 4)-L(P/F, 15, 4)$$

$$PW = 1,008+1,008(1.626)+(1,025+119)(.6575)+119(.5718)-1,122(.5718)$$

$$PW = 1,008+1,639+752+68-642$$

$$PW \text{ LEASE} = \$2,825 \text{ (Exercise Purchase at Maximum Accrual Point.)}$$

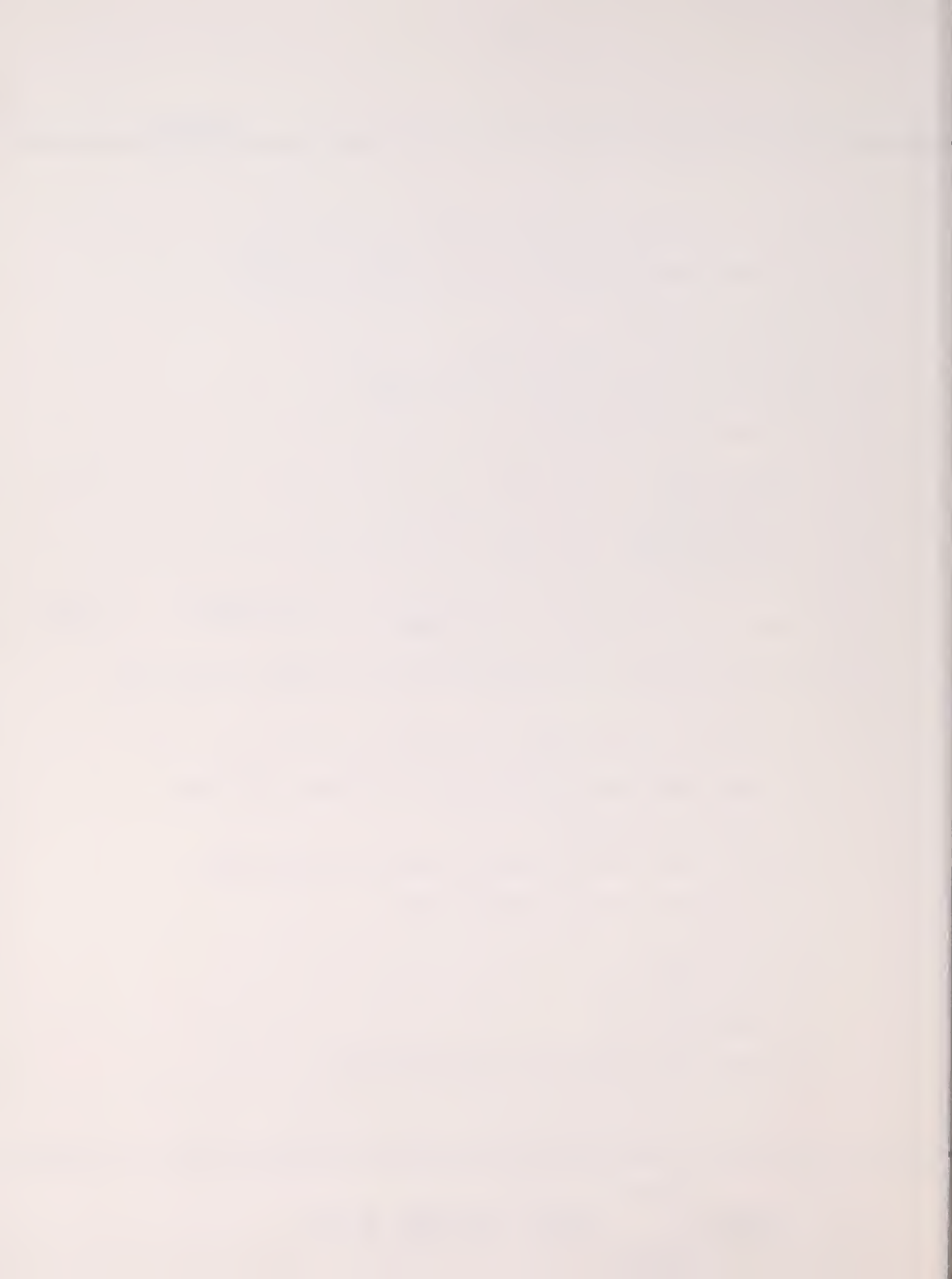
b. Lease Without Exercise of Purchase Option

$$PW = C+C(P/A, 15, 4)$$

$$PW = 1,008+1,008(2.855)$$

$$PW = 1,008+2,878$$

$$PW \text{ LEASE} = \$3,886 \text{ (No Exercise of Purchase Option)}$$



4. Rent in Thousands (000)

a. With Exercise of Purchase Option

Present Worth	=	PW
Annual Rent	=	C
Purchase Price	=	P
Less Accruals	=	P
Maintenance Cost	=	MC
Salvage	=	L

$$C = 1,008$$

$$C = 1,008$$

$$C = 1,008$$

$$P = 3,142-1,571$$

$$MC = 119$$

$$L = 1,122$$

$$MC = 119$$



$$PW = C + C(P/A, 15, 2) + P + MC(P/F, 15, 3) + MC(P/F, 15, 4) - L(P/F, 15, 4)$$

$$PW = 1,008 + 1,008(1.626) + (1,571 + 119)(.6575) + 119(.5718) - 1,122(.5718)$$

$$PW = 1,008 + 1,639 + 1,111 + 68 - 642$$

$$PW \text{ RENT} = \underline{\$3,184} \text{ (Exercise Purchase at Maximum Accrual Point)}$$

b. Without Exercise of Purchase Option

$$PW = C + C(P/A, 15, 4)$$

$$PW = 1,008 + 1,008(2.855)$$

$$PW = 1,008 + 2,878$$

$$PW = \underline{\$3,886} \text{ (No Exercise of Purchase Option)}$$



FINANCIAL ANALYSIS

<u>Financial Plan</u>	<u>Total Cost</u>
1. Outright Purchase	\$2,959
2. Installment Purchase	\$2,350
3. Lease (State and Local Government)	
a. With Purchase Option	\$2,825
b. Without Purchase Option	\$3,886
4. Rent	
a. With Purchase Option	\$3,184
b. Without Purchase Option	\$3,886

